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FLIGHT

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Hawker Harbinger

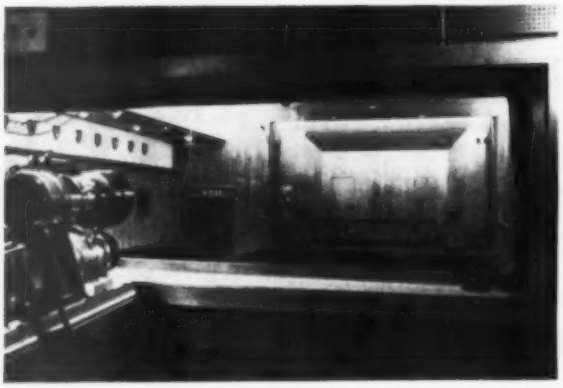
A FAVOURITE diversion during the winter months ahead will be the suggesting of names for Britain's newest aeroplane, the VTOL/STOL Hawker P.1127; and if the name is to be decided by fitness alone Hawkers could do far worse than settle on "Harbinger," for this aircraft is in truth a forerunner and a pioneer. In itself a weapon of incomparable flexibility, having an entirely new significance in the tactical strike role and opening up fresh possibilities of naval/air co-operation, it is at the same time a portent of great things to come in air transport. Together with Short's SC.1, it is showing the world just what can be done when the best brains in the airframe and engine fields are jointly concentrated on a challenging problem. Never have there been more significant aircraft than these two; and the successful completion of the P.1127's initial hovering trials—less than five weeks after the first tethered lift-off—have rightly won national acclaim for the Hawker technicians, headed by Sir Sydney Camm, and for those at Bristol Siddeley under the direction of Dr Stanley Hooker.

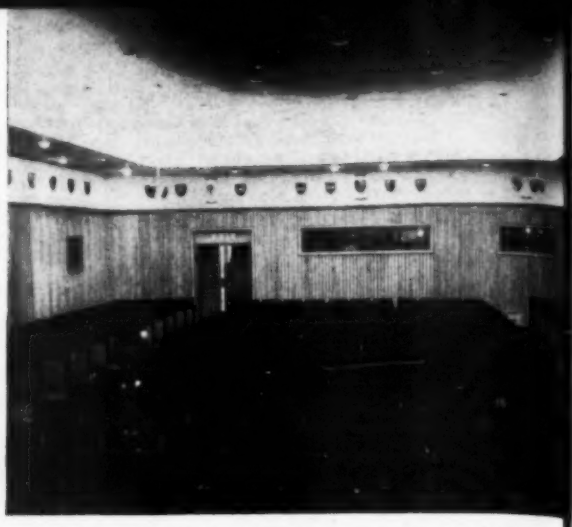
Though the basic principle of the P.1127's powerplant, the BS.53, may not be of British origin, its development and practical application most assuredly are. The ability to use the same engine both to lift an aircraft and to propel it in flight is indeed a dream come true; and, if the new Hawker shapes up as well as its pilot Bill Bedford seems confident that it will, other splendid dreams may eventually be realized. They were foretold by Dr Hooker in a remarkable paper abstracted in *Flight* of January 1 last. Having outlined the operational technique for a single-engined military VTOL aircraft of the P.1127 type, Dr Hooker went on to expound the Bristol Siddeley philosophy respecting VTOL transports. Since the main problem was to obtain a thrust equal to the aircraft's weight, he said, it followed that all the engines should be capable of giving their full power in the form of lift. In other words, engines used solely for propulsion were, in his estimation, undesirable. Once in normal flight most of the power units could be shut down, since the cruising thrust required would be perhaps one-tenth of the weight of the aircraft. The engines which would be shut down for cruise, and used only for take-off and landing, would, of course, have to be specialized lift engines and of minimum weight.

The Answer?

This approach—and it may well be that selected for our first STOL airliners—is in essence the combination of the Griffith jet-lift formula with the swivelling-jet principle as now seen in the P.1127. Dr Hooker considered a VTOL transport aircraft with two BS.53s and four lift engines. Though the total installed-weight penalty of the lift engines exceeded 3,000lb Dr Hooker considered that such an aircraft might have a payload of up to 10,000lb and a high subsonic speed. For operation from conventional runways, using the BS.53s only, it would gain substantially in range and payload. Developing the theme further, Dr Hooker went on to consider a jet-sustained wingless vehicle with a lifting capacity almost equal to that of the largest helicopters and roughly twice the speed.

These then are the sort of aircraft of which the P.1127/BS.53 combination may prove to be the harbinger. Not the least remarkable aspect of this union is that, although it has a vast intrinsic value as a research tool, it is at the same time a weapon system designed to render operational service after the usual development flying. Especially apposite, we thought, was the remark by the *Daily Express* air correspondent concerning the telephone used by Bill Bedford to talk, as he hovers, to observers. "On that telephone," said the *Express*, "he is calling the future." It looks as though the answer will be yes.





FIRST NIGHT: The new lecture theatre of the Royal Aeronautical Society at 4 Hamilton Place is due to be officially opened by Lord Brabazon tonight (December 2) at 7 p.m. These two photographs show the respective viewpoints of lecturer (right) and projectionist in the new hall, which seats 310 people and incorporates an impressive variety of audio and visual aids

FROM ALL QUARTERS

Airliner Aid

ASKED to state "the nature and extent of the financial support given to the aircraft industry in respect of the D.H.121, the Argosy, the VC10 and the Super VC10" the Minister of Aviation said in the Commons last week that "we had better stick to the system we have always had, that we state support in round figures without going into details in particular contracts." Mr Peter Thorneycroft was replying to Mr G. R. Strauss (Lab, Vauxhall) who thought it was time that Parliament had some information about this matter.

"I would not go so far," said Mr Thorneycroft, "as saying that the right hon Gentleman will not get any information, but I think it would be wrong to give the details of these contracts." Mr Thorneycroft gave a round figure of £9.4 million in the 1960-61 Estimates as having been provided "for assistance for the development and proving of transport aircraft." He might, he said, be able to give some indication of the type of assistance given, but "certainly not the details."

Canada/US Defence Talks

FOR almost a year it has been known that the US and Canadian governments have been discussing reciprocal acquisition of certain defence equipment, and the Ottawa correspondent of the London *Daily Telegraph* stated on November 24 that these discussions are still very active. According to this correspondent, Canada wishes to take over the remaining 20 radar stations of the Pinetree line, in addition to the 14 she already operates. By thus easing the burden on the USAF it is hoped to reduce the purchase price of the McDonnell F-101B Voodoo intercepters (66 of which are said to be involved) which are partially to replace CF-100s in the RCAF. The original scheme was that, in return for the Voodos, the US Military Air Transport Service would purchase 32 Canadair CL-44 freighters.

BEAGLE Developments

TWO announcements have been made about BEAGLE (British Executive & General Aviation Ltd). One was that arrangements were agreed last Friday for the acquisition by the BEAGLE Group of F. G. Miles Ltd, Shoreham Airport, Sussex; and the other stated that the Group had appointed Mr R. J. B. Woodhams as chief designer.

All the executive directors of F. G. Miles Ltd are to continue in their present posts. Mr Peter Masefield and Mr L. Blount will join the Miles board, Mr Masefield becoming chairman. Mr F. G. Miles is to be deputy chairman and Mr J. W. P. Angell general manager.

Mr George H. Miles (who is already a director of the BEAGLE co-ordinating board) is being appointed chief engineer of the BEAGLE Group, which now comprises British Executive & General Aviation Ltd and its two subsidiaries, Auster Aircraft Ltd and the Miles aviation interests.

These steps are, it is stated, "the logical development of the manufacturing and technical liaison which has existed between BEAGLE and F. G. Miles Ltd since the announcement of the new aircraft company. Miles aeroplanes have been known throughout the world in the light aircraft and military trainer field during the past 30 years. The new arrangements, together with Rolls-Royce's intentions already announced [*Flight*, November 4] further consolidate and strengthen Britain's re-entry into world markets for light and executive aircraft."

Mr R. J. B. Woodhams

Mr R. J. B. Woodhams, whsc, BSC, AFRAeS, AFIAS, appointed chief designer of BEAGLE, was due to take up his new duties yesterday (December 1) and will be responsible for leading and co-ordinating the whole design effort on the new range of BEAGLE executive aircraft. He has been with Bristol Aircraft Ltd since May 1956, joining the company as designer-in-charge, having previously been chief designer at Air Service Training Ltd. It was at Filton that he became specifically interested in the design aspects of light aircraft, and it was there he first worked with Mr Peter Masefield. Aged 44, Mr Woodhams is the son of Mr H. M. Woodhams, who recently retired from the chairmanship of Sir W. G. Armstrong Whitworth Aircraft Ltd.

American V/STOL Transports

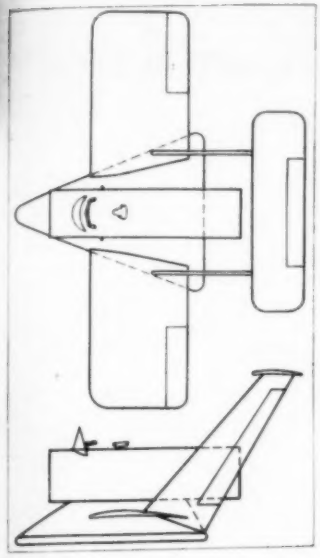
APPOINTED manager of the joint USAF/Navy/Army V/STOL transport programme, the Navy's Bureau of Weapons is issuing to manufacturers a specification for a competition closing next March. Gross weight must be not more than 35,000lb with an 8,000lb payload, and the aircraft must be able to cruise at 300kt and have an STOL ferry range of more than 1,500 n.m. On a hot day it must be possible to hover at sea level with full payload.

WHITTLE AND WIGGIN: In one of their last visits as a "team," members of No 111 Sqn last month toured the Hereford plant of Henry Wiggin & Co Ltd. They are here seen with their CO, Sqn Ldr Peter Latham, having the Nimonics of an early Whittle unit explained by Dr L. B. Pfeil, FRS, vice-chairman of Mond Nickel, and Mr H. W. C. Hignett, managing director of Henry Wiggin

TWO OF SIX Fairey Gannets delivered to the Indonesian Government are seen before leaving Airwork Services' base at Hurn with their pilots, R. M. Carter and D. E. Parker, who, together with engineers P. H. Aplin and H. Manners, were outward bound via France, Italy, Greece, Turkey, Cyprus, Persia, Persian Gulf, Pakistan, India, Burma and Singapore

Off the Ground, into the Air

IN a *Flight* article last week, "Riding the Hoverscooter," the question was asked: "Amusing toy, or genuine development vehicle?" It was suggested that ground-effect machines such as the AirRhoCar "*could* lead down an avenue as yet unexplored—short take-off not down a runway but by accelerating a semi-conventional aircraft off a cushion of air."



The accompanying drawing shows the ideas of Rhoades Inc on how this might be accomplished; and a vehicle of this type is believed already to be in the early stages of construction. Under control of the pilot are normal aircraft surfaces and a butterfly valve which, once sufficient lift has been generated by forward speed, diverts air from the ground cushion into the duct for forward propulsion. Interest in a basically similar vehicle is also being displayed by the United States Army Transportation Research Command, who have awarded Boeing's Vertol Division a $37,458 contract for a 12-month design study and preliminary design of a GETOL—ground-effect take-off and landing vehicle.

Wind-tunnel tests are to be conducted with a model of about 6ft span to examine the feasibility of the project; the idea is to find an aircraft which the US Army could operate independently of prepared landing strips. The wind-tunnel studies will be conducted at Princeton University's Forrestal laboratory and assistance of the same university may again be made available to Rhoades, whose design is intended for commercial exploitation.

IN BRIEF

The Duke of Edinburgh, as president of the Royal Society of Arts, presented to Sir Frederick Handley Page at Buckingham Palace on November 22 the Albert Medal of the society awarded to him "for leadership in the design and manufacture of aircraft."

The MoA have announced the appointment of Mr F. E. McGinnety as Director-General of Inspection. He has been Deputy Director-General since 1957.

Mr Henry Hardman, CB, at present a deputy secretary in the Ministry of Aviation, has been appointed permanent secretary in succession to Sir William Strath, KCB, who is retiring from the public service at the end of this year.

The Austrian Ministry of Defence has signed a contract with Saab for 15 J29Fs. These aircraft, latest version of the "Flying Barrel," are still in service with the Swedish Air Force but will be bought back by Saab and delivered to Austria, after thorough overhaul, from the spring of 1961 onwards.

What is believed to be the first practical application in Britain of corn drilling from the air was carried out in the Halesworth, Suffolk, area last week. Operated as an emergency measure because heavy rains have made normal methods impossible, the drilling was done by Austers of the Lincs Aerial Spraying Co on charter to Frank Pertwee and Sons Ltd of Colchester.

Canadair Ltd have announced four senior appointments. Mr Frederick R. Kearns, formerly vice-president and comptroller, has been made executive vice-president for sales and finance; Mr John Urwin, who was secretary and treasurer and legal adviser, becomes vice-president and secretary; Mr John B. Hunter, assistant comptroller since 1957, has been made comptroller; and Mr Theodore C. Pawlett, also an assistant comptroller, becomes treasurer.

ELLIOTT PRECISION radar control system is explained to members of the SHAPE Air Defence Technical Centre by Mr J. Engledew, technical manager of the Weapons Division of Elliott Bros (London) Ltd. The occasion was a recent visit to the company's Boreham Wood establishment which also houses several other divisions

Potez Air Fouga have equipped a CM.170 Magister with a Bertin "pamplemousse" silencer, tests of which at the Bretigny Flight Test Centre indicate a "considerable reduction" in noise-level.

Fairey Air Surveys have been awarded a contract to map 270 miles of roadway in Iran as part of a major road reconstruction project to link Turkey with Teheran.

No 804 Sqn, Fleet Air Arm, was "moving house" this week from RNAS Lossiemouth to the Mediterranean. Six of its Scimitars were flying direct from RNAS Yeovilton to Gibraltar last Monday, prior to embarkation in HMS *Hermes*.

As a move to reduce the number of US meetings on similar technical subjects, a combined national meeting of the Institute of the Aerospace Sciences and the American Rocket Society will be held in Los Angeles during June 13-16, 1961.

The processing of climatological information to meet the needs of aviation is one of the topics to be discussed at a meeting of the Climatology Commission of the World Meteorological Organization at Church House, Westminster, during December 1-15.

During August the number of people employed in Britain in manufacturing and repairing aircraft stood at 281,700. This was the highest figure since June last year and an increase of 1,500 over the July 1960 total—representing the largest monthly increase for four years.

The "sudden death" of Col Aleksander Grigorievich Vasilchenko, one of the Soviet Union's leading test pilots, was announced in Moscow on November 18. Vasilchenko had been test-flying for 25 years and helped to develop some of the latest supersonic Russian jet aircraft.

Entries for the next All-England Aircraft Recognition Competition—to be held at the Royal Aeronautical Society, 4 Hamilton Place, London W1, on January 21, 1961—must be received by the organizers, the Aircraft Recognition Society, 15 Tavistock Street, Covent Garden, London WC2, by December 31. The competition is open to teams of three members representing any recognized club, society or body interested in aircraft, units of HM Services—including the CCF, ATC, WJAC, ROC—and of NATO.

The first P.1127, with undercarriage fairings removed, in free hovering flight. At the foot of the page it is seen at Dunsfold before its first flight on October 21

P.1127

Hawker's V/STOL Strike Aircraft

IN *Flight* of August 12 last an account was published of the development of the Bristol Siddeley BS.53, the first engine in the world designed to provide both thrust and lift directly. Around this engine Hawker Aircraft Ltd, at Kingston-on-Thames, have designed the P.1127, the world's first vertical-take-off combat aeroplane. In under five weeks the first 1127 has completed its hovering trials, and we are now able to publish illustrations.

As was outlined in the issue already referred to, the germ of the idea was conceived by Michel Wibault, the eminent French aircraft designer, who early in 1957 approached the technical staff of the Mutual Weapons Development Programme in Paris with a scheme for a lift/thrust powerplant. His idea was that a large gas turbine should drive through bevel gearboxes to four centrifugal fans with controllable discharge volutes so that their delivery could be turned downwards or to the rear. The engine he chose happened to be the BE.25 Orion, and MWDP accordingly passed the scheme to Bristol Aero-Engines, with the assurance that they would provide financial support covering the greater part of the development cost.

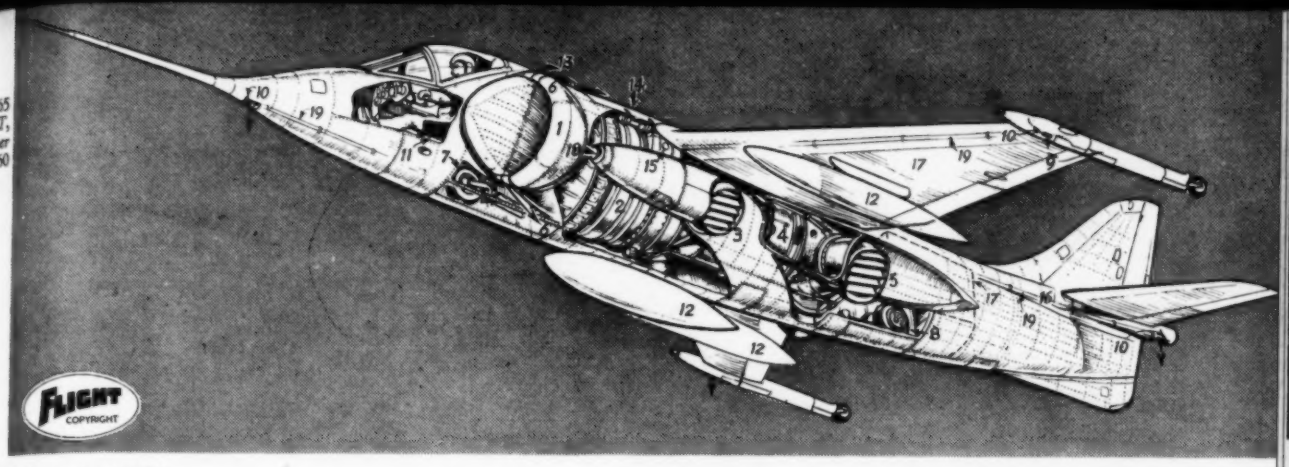
Engineers at Patchway put forward the BE.52 proposal, whereby an Orpheus would drive through a forwards extension shaft to a large-diameter fan (actually three stages from an Olympus compressor), both the cold and hot flows being led to swivelling nozzles. This suggestion seemed little less clumsy, and so the same rotating components were brought together to form the BE.53 engine—basically a turbofan, similar to those evolved at the same time by Pratt & Whitney. When Bristol Siddeley Engines was formed in April 1959 the engine was redesignated BS.53, and it has since been one of the new company's most important projects.

Not long after Bristol had begun to work on the engine, Sir Sydney Camm, chief engineer of Hawker Aircraft, talked to their project department about the possibility of using it in a VTOL combat aircraft. It was apparent that the Hawker P.1121 was not likely to receive an MoS development contract, and that short-field or VTOL ability, with an eye on NATO requirements, was the obvious thing to go for. Many have demonstrated that if one aims at VTOL ability the resulting aeroplane can do half the job of competitors who use a runway; but the P.1127 was formulated as a vehicle which could rise vertically if need be, and could also work from a runway with a big overload. It certainly seemed attractive enough to sink a lot of company money into it.

Essentially what the Kingston team did was to take a BS.53 and wrap round it a minimized airframe which could not only meet the NATO requirement for tactical strike and close support but might also be adopted by the RAF as a replacement for the Hunter FGA.9. Sir Sydney's team wrote their own specification, just as the engine designers had done; but their experience, and close liaison with MWDP, ensured that the outcome would be a usable military vehicle.

The BS.53 ran in August 1959, and the nozzle and control system have now been brought to the very high degree of reliability required. Further impetus to the programme resulted from the decision of the Ministry of Aviation last May to award a development contract for a number of prototypes.

The first of these was completed at Dunsfold, Surrey, in September, resplendent in a creamy gloss finish. The photographs show that before hovering started many items (such as the undercarriage doors and outrigger fairings) were removed to save weight. Initial flight-testing consisted of hovering trials, by A. W. "Bill" Bedford, Hawker's chief test pilot. He first lifted the 1127 clear of the ground on October 21, and following the tethered programme has completed the free hovering tests in approximately one month. He sums up this phase by saying,



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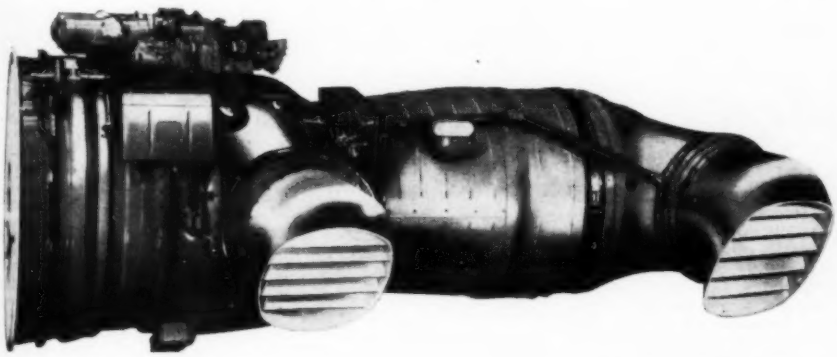
In the present state of the art most VTOL aeroplanes (as distinct from helicopters) have proportionately large propulsive systems, and the entire heart of the P.1127 is occupied by the BS.53 lift/thrust engine. Our artist has shown the first P.1127 after vertical lift-off, with the engine nozzles about to rotate towards the rear. By lengthening the nose it should be possible to produce a tandem-seat trainer in VTOL techniques

1, variable-geometry intakes (inflatable?), shown in hovering configuration; 2, fan section of engine, handling cold air; 3, rotatable nozzle for cold fan discharge; 4, hot section of engine; 5, rotatable nozzle for hot gas jet; 6, boundary-layer splitter wall; 7, nose undercarriage (reminiscent of Hunter); 8, main undercarriage unit; 9, outriggers; 10, bleed-air control jets; 11, ejection seat; 12, underwing and centreline stores; 13, cockpit air spill; 14, access to power accessories; 15, oil tank; 16, slab horizontal tail; 17, probable locations of fuel; 18, intake to cooling radiator; 19, air pipes to 10 from bleed tapping on compressor delivery casing.



This is the first photograph to show the Bristol Siddeley BS.53 in the form in which it is installed in the P.1127. In no other engine can the whole of the efflux be rotated backwards for forwards thrust, forwards for in-flight braking and downwards for lift. Such was the confidence placed in it that the BS.53 flew for the first time as the powerplant of the P.1127, and not in a flying test bed

"The P.1127 handles beautifully, and if the hovering trials are any indication of its future success then Hawkers have a real winner."

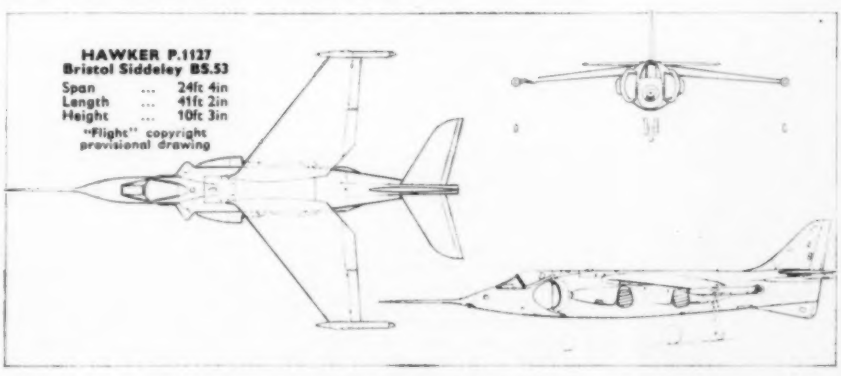
Most of the significant features of the 1127 can be seen in our simple cutaway. The Hawker design staff must have learnt much from the RAE and from Short & Harland's work on the SC.1. Like the latter aircraft, hovering control is exercised by bleed-air jets at the extremities of the body and wings. There must be an autostabilization system, and probably a programme control will be evolved for rotation of the main-engine nozzles in order to achieve the optimum transition from jet-lift to wing-supported flight and *vice versa*.

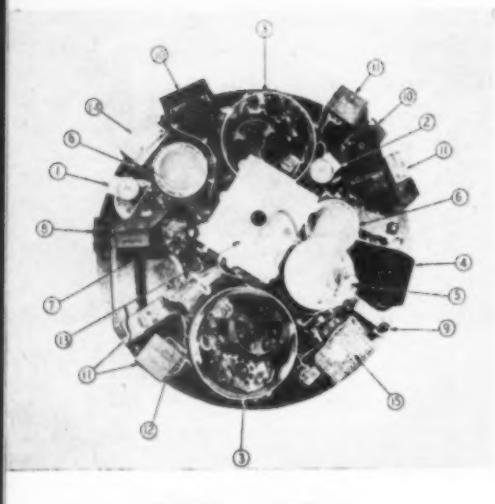
Jet-lift aeroplanes can have relatively small wings. Nevertheless the P.1127 must be designed for dead-stick approaches with rudder, ailerons, slab tail, wing flaps and probably a drag chute and brakes on both fore and aft undercarriage units. Flight profiles must also be so chosen as to minimize the dangerous combination of engine failure at low altitude and low forward speed.

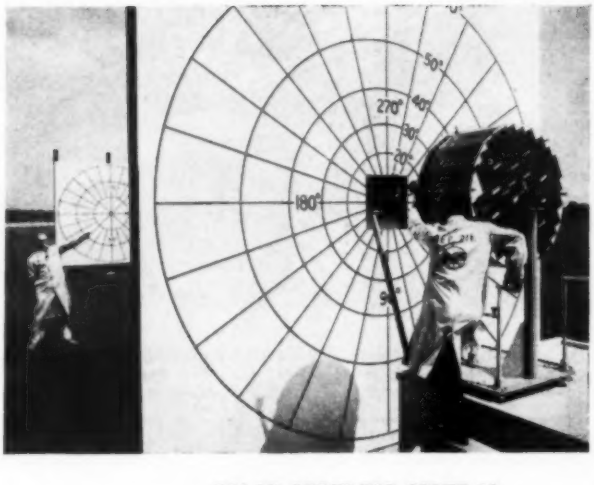
It cannot be over-emphasized that the 1127 is not an experimental research aeroplane but an operational strike aircraft. Pylons on the centreline and under the wings could carry tactical nuclear weapons, gun packs, simple missiles (Bullpup, Sidewinder and Nord AS.30) or cameras, countermeasures or NATO stores up to a unit weight of around 1,000lb. Prime mission is close-support against surface targets, and since no airfield is needed the aircraft could be based within a few hundred yards of the troops who would call upon it. It should also be possible to operate the 1127 from many types of ship. The possibilities here are legion, and one pertinent fact may be that RAF pilots are already likely to receive training in carrier operations in order to increase the flexibility of our overseas forces.

In our November 11 issue we published a survey of the later V/STOL projects with which the P.1127 may have to compete. There is a school of thought in NATO that the next generation following the G.91 should have a maximum Mach number of about 2, and many companies are attempting to produce jet-lift derivatives of existing M2 aircraft while other firms produce new ideas from scratch. The Hawker design in its present form is not supersonic; but this "bird in the hand" is worth a whole squadron in the bush, and is a very acceptable piece of hardware.

Its progress has recently been inspected by senior representatives of the Ministry of Defence, Air Ministry, Ministry of Aviation, RAF, Royal Navy, USAF, US Army, RCAF, West German Government, French Armed Forces, and other interested parties. While the second machine nears completion, the first will be taken by road to RAE Bedford, where it will fly as a conventional aeroplane. The gaps in its flight envelope will be progressively closed, until the spectrum is continuous from the speed of sound down to zero.







Left, testing of Tiros 2. For left, plan view of 42in diameter Tiros 2 interior: (1) wide - angle TV camera; (2) narrow-angle TV camera; (3) television tape recorders; (4) infra-red system, five - channel radiometer; (5) infra-red system electronics; (6) electronic clocks for timing sequence; (7) relays for magnetic stabilization system controlling satellite's attitude; (8) control box for electronic systems; (9) infra - red horizon scanner; (10) electronic circuits for cameras; (11) electronic circuits for TV tape-recorders; (12) telemetry switches; (13) antenna diplexer (covering storage batteries); (14) automatic signal generator; (15) fuse board, current regulator

Missiles and Spaceflight

WEATHER EYE OPEN

The United States' second experimental meteorological satellite, Tiros 2, was successfully launched from Cape Canaveral on November 23. Weighing 280lb, the satellite carries two television cameras to photograph cloud cover and seven infra-red detectors to measure solar and Earth radiation, and was placed in orbit having an initial apogee of 435 miles and perigee of 415 miles. The planned orbit was circular at a height of 380 miles.

The launch of Tiros 2 comprised the second successful flight of the three-stage Delta booster, which was designed, built and launched by Douglas Aircraft Co. First Delta launch was of Echo 1 on August 12. The Tiros 2 launch sequence was as follows:

The first-stage Thor engine fired for 158sec after lift-off. After cut-off this stage separated, and the second stage ignited and continued to burn for 109sec before being shut off by radio-guidance command. The combined upper stages then coasted for about 7½min, travelling 1,100 miles downrange and reaching orbital altitude. Spin rockets were then fired, causing the third stage to revolve at 125 r.p.m. Thereafter, in rapid succession, the second and third stages separated, the third-stage engine ignited (burning for 42sec) and the third-stage engine and payload entered orbit. Two minutes later the satellite separated from the third stage, separation being effected by a spring mechanism.

Early reports stated that the small-angle, high-definition television camera had been functioning well, but that the wide-angle camera had developed a fault, possibly due to a heavy initial power drain on the batteries.

On November 21 at Cape Canaveral a Redstone booster, scheduled to launch its Mercury capsule 220 miles down the Atlantic Missile Range, failed to rise more than a few feet from the pad. The emergency rockets designed to separate capsule from booster then fired but, as this remarkable photograph shows, the only separation achieved was of escape pylon from capsule. The Redstone settled back on the pad where, according to Reuter, it "smouldered" for two days while lox evaporated from the vent valve

POLAR ORBIT FOR SCOUT 2?

The second Anglo-American satellite, Scout 2, may be launched from the Pacific Missile Range into a polar orbit. This will depend on the strength of the scientific case for a polar orbit, and as yet no formal commitment has been made as to the experiments to be carried out. According to Mr M. O. Robins, speaking before the Students' and Graduates' Section of the Royal Aeronautical Society on November 23, this uncertainty "does not mean that there isn't a lot of work going on." In contrast to the experiments in Scout 1 (*Flight*, October 21, 1960), much of the proposed Scout 2 apparatus will have moving parts, and these pose a special problem as conventional lubricants are unsuitable for spacecraft use.

Mr Robins, who is British project manager for the joint satellite programme, confirmed that Wallops Island would be the launching site for the first Anglo-American satellite late next year. This satellite is expected to pass over Britain, but will be too small to be visible to the naked eye. Mr Robins' paper, titled *The British Space Research Programme*, included a review of Britain's contribution to satellite tracking studies, mentioning the almost-complete Minitrack station to be operated by Radio Research Station personnel at Winkfield and a new optical tracking station which is being set up in Malta. Further expansion was likely in collaboration with other European and Commonwealth countries.

A recent discovery made through the analysis of ground-based tracking data, Mr Robins reported, was that there was a "perfect correlation" between variations in satellite drag and variations in solar activity. When the Sun is most active, satellites experience maximum drag, and vice versa.

The first two-stage Pershing selective-range bombardment missile to fly successfully completed a 160-mile test from Cape Canaveral on November 16. The US Army stated that all test objectives were achieved.

First of the "stretched" FBM submarines, USS *Ethan Allen* was launched from the Electric Boat Co at Groton, Conn, on November 22. Her surface displacement of 6,900 short tons (8,600 submerged) makes her easily the world's largest submarine. Her armament will be 16 Polaris A2 (extended-range) missiles.

In recent advertising in the US, British Aircraft Corp confirm that Blue Water has inertial guidance, solid propulsion and exceptional mobility. The Corporation's executive director for guided weapons, Lord Caldecote, said recently in Sydney that extended-range trials at Woomera will shortly begin. According to the London *Daily Telegraph* the maximum range over which the missile could be fired at Aberporth was some 45 miles.

Convair's Pomona Division, prime contractor for the Mauler (*Flight*, November 4) air-defence system of the US Army, has awarded a $300,000 contract to Hughes Aircraft for a guidance unit. According to Hughes the weapon "will incorporate new techniques in the art of missile guidance . . . the guidance component will enable the Mauler to attack and destroy attacking aircraft and short-range tactical missiles, and will steer the Mauler through sudden changes of direction to compensate for target evasive manœuvres."

Sounding-rocket firings from Woomera last month included three successful Skylark shots. On November 16 a single-stage Skylark was fired to a height of 68 miles for what the Ministry of Aviation described as "RAE research purposes" and the Australian Minister for Supply described as the first experiment to test drift and precision of gyros. On November 17 a two-stage Skylark was used in a Belfast University experiment to determine wind velocities and temperatures in the upper atmosphere; and on November 24 a single-stage version was fired in a measurement of electron density by University College of Wales, Aberystwyth.

Missiles and Spaceflight . . .

MERCURY—AND AFTER

BY KENNETH OWEN

IN America's first manned-spaceflight programme, inevitably, the greatest interest has been focussed on the men themselves —the seven Project Mercury astronauts whose selection and training was described in last week's issue. But their ballistic flights down the Atlantic Missile Range, and the Earth orbits that will follow, will be the end-product of a massive national effort. Co-ordinating this effort, and the even more ambitious programme that is to follow, is the Space Task Group of the National Aeronautics and Space Administration at Langley Field, Virginia.

When the time comes for the first astronaut to make a ballistic flight in a Redstone-boosted space capsule, the man with the responsibility of deciding who shall go will be Mr Robert R. Gilruth, Director of the Group and of Project Mercury. In Mr Gilruth's office in the Group's headquarters building at Langley—whose entrance lobby carries a NACA inscription and an illustrative history of flight from 3,500 BC (Assyrian record of man flying to heaven) to 1960 (Little Joe on the pad)—we discussed the overall Mercury programme.

Robert Gilruth was previously Assistant Director of Langley Research Centre, with a particular interest in structures and high-temperature work. Earlier, with the National Advisory Committee for Aeronautics, he had been concerned with aerodynamics, flight test and flight handling; and had helped to build up from scratch NACA's flight research with rocket vehicles at Wallops Station, Wallops Island, Virginia. In all, a good background for the unique combination of manned flight, rocketry, and high-temperature problems that is his present job.

Within the framework of overall policy written by the Office of Space Flight Programs at NASA Headquarters, management of Project Mercury and the manned spaceflight programme in general is in the hands of the Space Task Group. For Mercury, the group's job is to bring along in parallel the various elements of the programme—which, Mr Gilruth emphasized, was a joint industry/Service/NASA affair and not purely an in-house effort. The four main aspects could be considered as (1) the launch vehicle, produced by Convair and launched by the USAF Ballistic Missile Division, whose job it was to provide the ride for (2) the flight vehicle, produced by McDonnell; (3) the worldwide tracking network, now nearing completion, for which Western Electric has the prime contract, and the central control at Cape Canaveral; and (4) the recovery forces, principally from the US Navy and Air Force.

We were talking before the Mercury escape-system failures of November 8 and November 21, but there had already been criticism that the Mercury timetable was seriously slipping. Mr Gilruth's comments, and in particular his reference to the research-and-development nature of the project, are equally pertinent now:—

"No, the programme has not slipped," he emphasized, "It could not have been done any faster. In research and development you can't give targets. One would expect four to five years for a project of this scale—I said it would take at least two years, and I had no idea of the co-ordination problems involved.

"Within one year of this group being formed, we demonstrated we had a pretty fair assessment of the re-entry problem with the first successful re-entry of Big Joe. A myriad of miniature equipment had to go into the system. The life environmental equipment had to be developed from scratch. Communications equipment had to be miniaturized. When you add all this up, plus testing, it takes so much time.

"We took one calculated risk and I reckon we've got away with it. This was to tell the contractor to go ahead while the R and D effort was continuing in parallel. Yes, we gambled on this, and saved a considerable amount of time. . . ."

Referring to the start of the flight-test programme in late autumn, the director said; "We'll be surprised if there are no surprises. We feel we have the right concept, and have been wise enough to put enough tests in it—this is expecting some surprises.

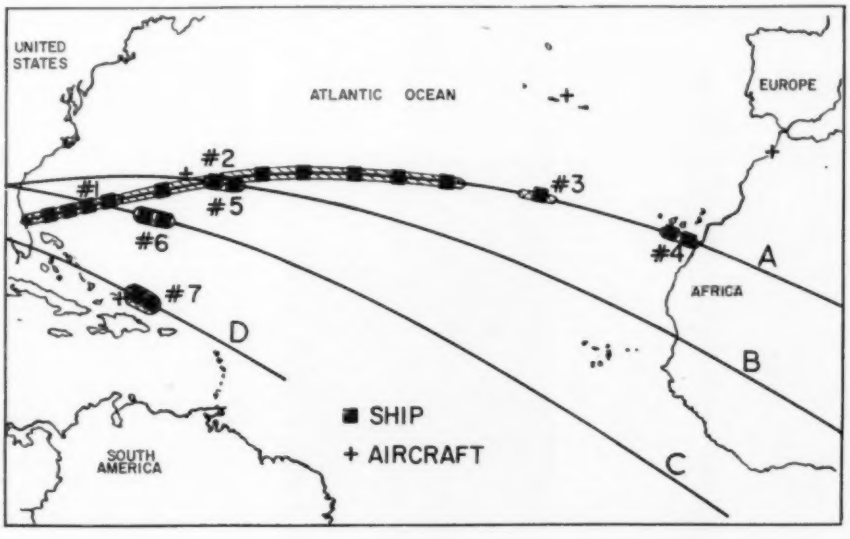
"We don't look at this as an end in itself. Mercury is just the start—the start of a continuing manned space research programme. To me, this is a flight research programme similar to the X series of research aircraft. Dyna-Soar and Apollo will follow-up Mercury techniques. Mercury is a first logical step.

"No, there aren't any short cuts you can make—unless, back at the start, we had changed the ground-rules. We said we should make the ballistic, suborbital shots with the actual orbital type of hardware. For a Mach 5 or 6 up-and-down shot you don't need the same heat shield or the same life-support system. We could have made the capsule twice the weight and, in that case, we could have gone up and down sooner. . . ."

How about the Soviet man-in-space programme? "I am surprised," Mr Gilruth replied candidly, "that they haven't done this before now."

We turned to consider in detail some of the individual aspects

Mr Robert R. Gilruth, Director of Project Mercury (right) in discussion with Mr Charles J. Donlan, Associate Director (Development)



Typical recovery forces for Project Mercury orbital flights. The continuous shaded area represents the initial injection period, with A, B and C representing the first, second and third orbits and D the planned recovery area after three orbits. In Area 1 the maximum access time for recovery forces to reach the capsule is three hours; in Areas 2, 3 and 4 this time is six hours

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of the Mercury programme. As outlined in last week's issue, each of the seven astronauts has an area of specialization in the development of the Mercury operation. Because the overall design and operational philosophy had already been established before the astronauts were selected, their direct contributions have been limited to modifications rather than completely new approaches, but significant changes have been suggested and effected in such areas as instrument panel layout, capsule design, and launch-pad and recovery procedures.

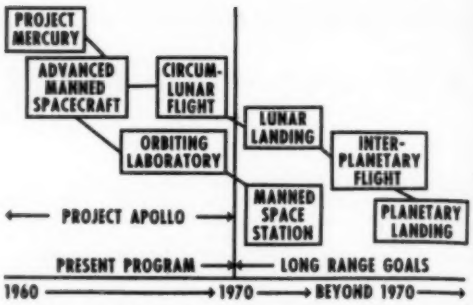
Among changes in the capsule design since the original concept has been the replacing of two small portholes with a larger window (21in × 11in); the addition of a quick-opening emergency hatch; and the addition of an air cushion between heat shield and capsule structure. The larger window permits the astronaut to observe the orientation of the vehicle and gives him a visual reference for controlling his position during retro-rocket firing. The emergency hatch is located within the side door (which is bolted in place after the astronaut has entered the spacecraft) and is opened in emergency by means of explosive bolts.

Although a successful mission will end with the spacecraft falling into the sea, an emergency could occur—such as an abort off the launch pad—which would mean impact on land. It is to provide extra impact protection in this event that the air-cushion device has been included. It consists of an extendable, 4ft long skirt of rubberized glass-fibre which fills with air after the main parachute has been deployed and the heat shield released. On impact the air escapes through holes in the skirt, thus providing a cushioning effect. As an incidental bonus, the impact bag serves as a sea anchor in the event of a water landing.

Approximately 20 testing, training, suborbital and orbital flights are planned for the next two years. The first manned suborbital flight, originally scheduled for "late this year" will now most probably take place next January, with the first manned orbital shot later the same year. The Redstone-launched suborbital flights will provide a 15-minute flight down the Atlantic Missile Range in which the astronaut will experience about 5min of weightlessness and a speed of some 4,000 m.p.h. Maximum altitude will be 125 miles, and the impact point is some 200 miles from the Cape.

For the orbital shots, the Mercury spacecraft will be launched by Atlas in a direction slightly north of east. This trajectory will inject the spacecraft into orbit at a point roughly over Bermuda, after which its altitude will remain approximately constant at 100 miles—corresponding to a satellite speed of about 18,000 m.p.h.

A world-wide system of tracking and communications stations will be in contact with the Mercury spacecraft almost continuously. Radar trackers at Bermuda, on the Canary Islands, in Australia, in Hawaii and across the Continental United States will obtain precise fixes of the satellite's position, from which predictions will be made of its future trajectory. Also, from communication and telemetry stations in Africa, Australia, on Cantor Island in the Pacific, at Point Arguello, California, and aboard ships in the Indian and Atlantic Oceans it will be possible to talk with the astronaut and to obtain data on the functioning of the capsule and on the health and reactions of the man himself.



NASA manned spaceflight programme, showing elements of present ten-year plan and more-advanced projects

CALENDAR YEARS	60	61	62	63	64	65	66	67	68
PROJECT MERCURY									
PROJECT APOLLO NASA RESEARCH									
INDUSTRY DESIGN STUDIES									
DESIGN & RESEARCH, DEVELOPMENT, & PROTOTYPE FLIGHTS									
EARTH ORBITAL & CIRCUMLUNAR FLIGHTS									

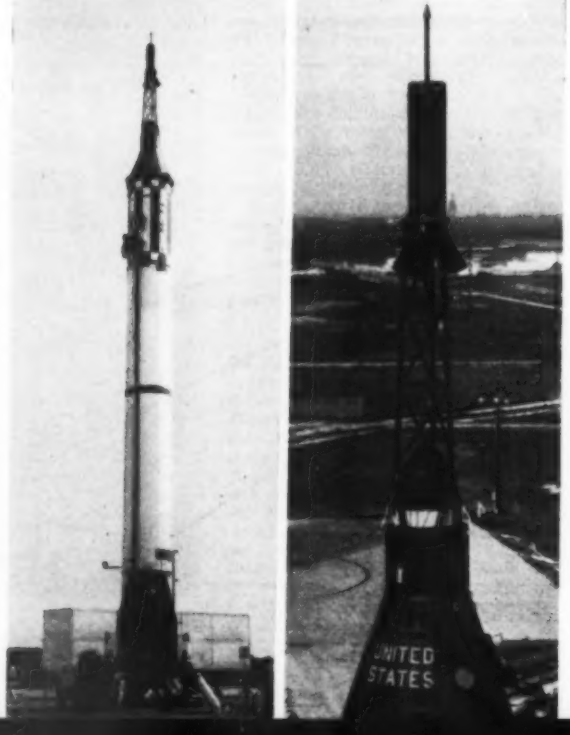
Programme phasing for Mercury and Apollo. Dates of beginning and end of shaded periods are approximate. Feasibility study contracts for Apollo were awarded last month by NASA to Convair, GE and Martin

Towards completion of the third orbit, as the spacecraft approaches the Californian coast, retro-rockets will be fired, slowing it down by some 350 m.p.h. so that it will descend towards the Earth's atmosphere and then re-enter, decelerating to a speed of about 600 m.p.h. The retro-rockets can be applied by the astronaut himself, by radio command from a ground station, or by an automatic timer aboard the spacecraft.

At about 42,000ft altitude a small parachute is deployed to stabilize the capsule, and at 10,000ft a large cargo-type parachute is deployed to lower the capsule at 30ft/sec to a landing in the Atlantic ocean near the Bahama Islands.

From immediately after lift-off until the recovery point is established, operational responsibility for the flight lies with the Mercury control centre at Cape Canaveral. Here the control staff have the following eight functions: (1) monitor flight, including launch, orbit and re-entry; (2) monitor astronaut and capsule status; (3) initiate any abort decision; (4) determine correct procedures following an abort; (5) command re-entry; (6) inform astronaut and range stations on the progress of the mission; (7) co-ordinate activities of the range stations; and (8) co-ordinate and inform the recovery forces. Flight-control personnel at certain of the outlying stations will also have responsibilities under items 1, 2 and 6.

An indication of the recovery forces involved is given in the diagram on page 867. From Cape Canaveral out along the initial trajectory into orbit the spacing of the recovery forces is relatively close, in order to cope with any emergency during the powered section of the flight and up to the orbital injection point. In the Area 1 shown on the chart the maximum access time for a ship to reach the spacecraft would be three hours; in Areas 2, 3 and 4, which cover the potential impact regions during Atlas sustainer operation, an access time of six hours is allowed. In the scheduled recovery area after a three-orbit mission, the ship spacing again provides a three-hour access time. Search for the spacecraft will be accomplished primarily by long-range aircraft



This Redstone booster/Mercury spacecraft combination will be used for the first manned ballistic shot scheduled for next month. Right, a close-up of the spacecraft and escape-rocket pylon. These photographs were taken before the unsuccessful November 21 test at Cape Canaveral

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based at Patrick AFB, Florida; Puerto Rico; Bermuda; the Azores and the African coast.

Before turning from this brief glance at the Mercury mission to look at more-advanced developments, it is relevant to question the basic need for manned exploration. NASA's view was expressed as follows in the Agency's third semi-annual report to Congress earlier this year:—

"Electronic instruments designed for NASA satellites and space probes can perform many intricate ultra-swift, ultra-accurate tasks of sensing and measuring better than men could ever do. However, the statistical information gathered and transmitted to Earth by these instruments constitutes only a part of the basic research necessary for understanding the larger realities of space. The most advanced apparatus can perform only as it is programmed to do. Instruments have no flexibility to meet unforeseen situations. Scientific data acquired in space mechanically must be balanced by on-the-spot human senses, human reasoning, and by the power of judgment compounded of these human elements.

"In this lies man's superiority to the machines he invents and builds. And in that superiority lies the necessity for manned spaceflight, as soon as it is practicable. But before man can fly to the Moon and beyond, the question of his ability to withstand the rigors of spaceflight—weightlessness, high-g forces, atmospheric entry forces, etc.—must be answered. These are the reasons for the top national priority that has been assigned to Project Mercury."

The overall organization of the Space Task Group at Langley is based on three main Divisions. Under the Director, and his two Associate Directors for Development and Operations respectively (Mr C. J. Donlan and Mr W. C. Williams) are the Flight Systems Division, Engineering Division and Operations Division. The entire group fits into the organization of the Goddard Space Flight Center, where Mr Gilruth has the position of Assistant Director, Manned Satellites. The Apollo project office forms part of the Flight Systems Division, and it was from Mr Robert O. Piland, assistant chief for advanced projects in this Division, that I learned something of the philosophy behind the ambitious follow-on which will be the next step after Mercury.

Project Apollo

The number of people working on Project Apollo at present varies between about 20 and 40, depending on the needs of the Mercury programme. Flight Systems is the first of the three divisions to slacken-off in its Mercury effort and transfer to a support function. As time goes on the Apollo team will be reinforced with personnel from the other two divisions.

Present studies in Project Apollo are of three main types. Firstly, there are the in-house conceptual studies at Langley. Secondly, there is the work of Langley Research Centre (separate from the Space Task Group) and other centres such as Ames, Lewis, JPL and Marshall, all of whom are directing their basic research activities on to the appropriate problems indicated by the overall guide-lines laid down for Apollo. Thirdly, there is the industry participation, which began last month with the award of six-month feasibility study contracts to Convair, General Electric and Martin. From the results obtained in these three ways the overall feasibility will be established and a specification will be written.

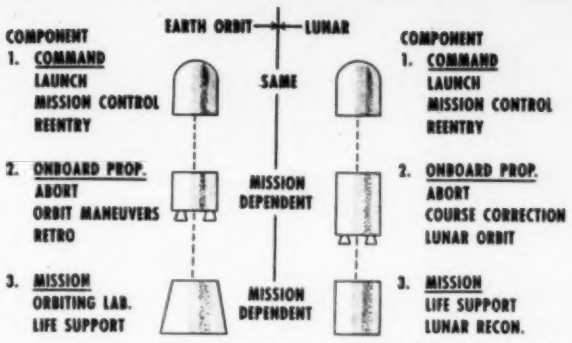
The results obtained in the Mercury programme could affect the development of Apollo—either in an acceleration or re-direction of effort—within the overall objective of obtaining a bigger and better space vehicle which will be applicable to a number of different missions. It was not known, Mr Piland said, whether Project Mercury would come to a halt after achieving its present objectives or whether it would continue, but an interesting point was that the Mercury capsules are re-usable and might be employed for advanced unmanned experiments. Fitted with new heat shields and escape pylons, used Mercury spacecraft could be utilized in the realistic testing of Apollo components.

The overall timetable which NASA has in mind for its manned spaceflight programmes is indicated in the two diagrams on page 868. In the lower diagram, it was emphasized, the indicated cut-off points for particular phases are not necessarily exact. Also illustrated (above) is a triple modular concept which represents current thinking on the broad design of the Apollo spacecraft.

As outlined by Mr George M. Low, Chief, Manned Spaceflight in the NASA Headquarters Office of Space Flight Programs, the intentions and requirements of Apollo are as follows:—

The basic objective is to develop and construct an advanced manned spacecraft with sufficient flexibility to be capable of both circumlunar flight and Earth orbital missions. This should lead eventually towards manned landings on the Moon and the planets, and towards a permanent manned space station.

In order to achieve the flexibility of mission mentioned above



Three elements of Apollo spacecraft envisaged for Earth orbit and lunar missions. Possible Apollo trajectories comprise Earth orbit, space probe, circumlunar flight and lunar orbit

the so-called modular concept has been proposed for the design of the spacecraft (see diagram). In this, various "building-blocks" or modules are employed for different phases of the mission. The spacecraft is conceived to consist of three sections; a command centre module, propulsion module and mission module.

The first of these would house the crew during the launch and re-entry phases of flight, and would serve as a flight-control centre for the remainder of the mission. The propulsion module would have as its primary function to effect a safe return to Earth in case of emergency—and in this sense might be compared to the escape pylon and retro-rockets on the Mercury capsule. In addition, this component would be able to make mid-course corrections in circumlunar missions; it might also be used to place the spacecraft in orbit around the Moon and to eject it from that orbit. For an Earth-orbital mission the propulsion section would permit manœuvrability in orbit or a rendezvous with other vehicles. For some applications these two sections alone might be considered as a complete spacecraft.

The mission module would be tailored to the particular flight objective. For circumlunar flight it would provide better crew quarters than the command centre could afford, plus some equipment for scientific observations. For Earth orbits the mission module could be considerably heavier than for circumlunar flight, and could therefore serve as a long-lifetime, well-equipped Earth-orbiting laboratory. The only module intended for re-entry and recovery would be the command centre unit.

It has been tentatively specified that the Apollo spacecraft should be designed for a three-man crew. During launch and re-entry the crew would be located in the command centre module, but for the remainder of the flight at least two of the crew-members would be in the mission module. The use of a pressure suit in the command centre unit might be acceptable, but the mission module should be designed for "shirtsleeve" operations—i.e., operations without pressure suits.

For any manned mission extending farther than low Earth orbits, the problem of radiation in space is of major concern. Three types of radiation are involved in circumlunar flight: (1) trapped Van Allen radiation, (2) cosmic radiation, and (3) solar flare particles.

According to NASA, the trapped radiation in the Van Allen radiation belts is of rather high intensity but of sufficiently low energy to make shielding feasible. Because the time spent in the radiation belts will be small, only a small amount of shielding is required for this type of radiation.

The energies of cosmic radiation are so high that shielding becomes impractical. However, the peak intensity is sufficiently low that no danger is expected in a five-day mission.

The most serious problem results from the particles generated by some solar flares. The energy of these particles is of a magnitude that may require more shielding than is practical from the standpoint of weight; following a major flare, the intensity may be so high as to cause severe biological damage. But there are some indications that it might be possible to predict major flares (or their absence) several days in advance.

The radiation problem, more than any other, requires a great deal of study before manned spacecraft can be employed for circumlunar flight. Many of the answers will be supplied through NASA's scientific satellite and probe programmes.

Weightlessness, and its effects on crew-members, is another important factor, and one in which Project Mercury experience will prove most useful in deciding whether it is desirable to incorporate artificial gravity into Apollo vehicles.

As indicated in the programme diagram, major Mercury flights are expected to continue at least until the end of 1962. Research and development, and prototype flights of Apollo spacecraft are listed to start in 1962 and to end in 1965. Early flights in this series would be used to verify final design criteria for the spacecraft shape and its heat protection; it is planned to use Atlas-Agena-B as the launch vehicle for these missions. Following the Atlas-Agena flights, the Saturn vehicle will be used for full-scale development and prototype flights. Earth-orbital missions, using the final spacecraft, could conceivably begin in 1966.

New York Airways Look Ahead

DURING a recent one-day stay in New York, a *Flight* representative interviewed Capt L. Carter, vice-president operations of New York Airways, to find out what progress was being made towards IFR helicopter operations in the area. The Federal Aviation Agency is, of course, engaged on a sizeable programme of IFR flights in multi-engined helicopters without passengers, running one scheduled flight each day in each direction between Bridgeport, Idlewild and the FAA experimental centre at Atlantic City, a total distance of about 160 miles. Military crews are employed, the pilots being posted to the operation for a few months at a time from the US Marines and Army. About 600hr have so far been flown and present weather minima are 500ft and one mile, although every flight is made either in cloud or under the hood.

New York Airways have virtually no contact with this official operation and are concentrating on routine passenger or charter operations in the New York area, although they did take part in the first series of official Decca trials. When that contract expired the Decca receivers were removed from the Vertol 21s and overhauled by Bendix Pacific, the American Decca agents. Three sets have since been installed once more and NYA are prepared to refit the remaining two Vertols as well. The purpose is to build up a maintenance organization and to familiarize pilots in preparation for the introduction of five Vertol 107s, the first of which is due next April. All the 107s will have Decca.

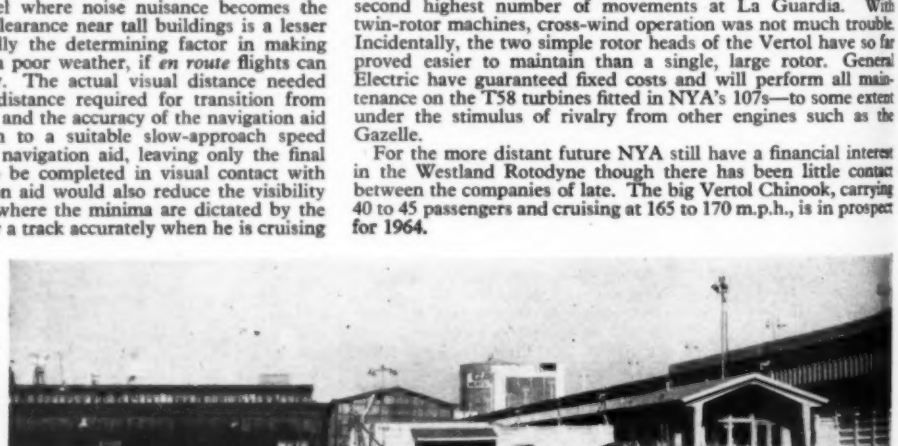
Present weather minima for the Vertol 21s are 1,000ft and three miles, but minimum cruising heights actually vary between 700ft and 1,500ft, according to the route, because of safety considerations for these single-engined machines. The 107s will be equipped for IFR flying and will initially be able to operate in minima of 500ft and one mile. A real reduction in minimum operating heights will be possible by virtue of the single-engined capability of the machine. The first step will be to reduce the height minima to the level where noise nuisance becomes the limiting factor. Obstacle clearance near tall buildings is a lesser problem. Visibility is really the determining factor in making approaches and landings in poor weather, if *en route* flights can be made without visibility. The actual visual distance needed could be defined by the distance required for transition from forward flight to the hover and the accuracy of the navigation aid used. Ideally, a transition to a suitable slow-approach speed would be made using the navigation aid, leaving only the final positioning and landing to be completed in visual contact with the ground. The navigation aid would also reduce the visibility needed for cruising flight where the minima are dictated by the ability of the pilot to follow a track accurately when he is cruising fast and able to see only the ground directly beneath him.

NYA are already achieving an 80 per cent completion factor, 17 of the remaining 20 per cent of flights not completed being accounted for by weather. Only 3 per cent of flights are stopped by mechanical trouble. Twin engines should improve the mechanical factor by 5 per cent. With an aid such as the Decca Navigator, a limited IFR operation might be run in visibility down to half-a-mile, but under fairly high ceilings. The completion factor might then be raised to 95 per cent.

The Vertol 107 will have duplicated stability augmentation; and an autopilot to maintain height and heading is being developed. The main flight instrument will be the Lear NAFLI globe horizon combining attitude and heading indication in a 4in dial. Sonic altimeters have been tried, but proved unreliable from 100ft up to their maximum indication of 200ft. Greater height ranges are required. Vibration raised problems with radio altimeters. The v.s.i. will be the Instrument Specialties Inc IVSI (instantaneous vertical speed indicator) which is a Kollsman capsule instrument fitted with an accelerometer. This would in some cases be a more important instrument than the horizon. Ball rather than needle slip indication will be employed in the turn-and-bank indicator and may in fact be specified by the FAA.

Fully automatic landing, Capt Carter said, was simply a question of time and money. Navigation and flight control were straightforward: the critical problem was ATC, because helicopters could not afford to become involved in fixed-wing traffic patterns. For NYA, Newark and Idlewild airports presented few difficulties for the Vertol 21s, but La Guardia was much smaller and there were the twin problems of fitting in with air and ground movements of fixed-wing aircraft. Active runways had to be crossed, often through the slipstream of aircraft taking off or landing—the Constellation left the most turbulent wake—and the landing area was often crossed by taxying aircraft. NYA had the second highest number of movements at La Guardia. With twin-rotor machines, cross-wind operation was not much trouble. Incidentally, the two simple rotor heads of the Vertol have so far proved easier to maintain than a single, large rotor. General Electric have guaranteed fixed costs and will perform all maintenance on the T58 turbines fitted in NYA's 107s—to some extent under the stimulus of rivalry from other engines such as the Gazelle.

For the more distant future NYA still have a financial interest in the Westland Rotodyne though there has been little contact between the companies of late. The big Vertol Chinook, carrying 40 to 45 passengers and cruising at 165 to 170 m.p.h., is in prospect for 1964.



New York Airways has a fleet of five Vertol 21s, one of which is seen, in the heading picture, being serviced at La Guardia. On the right is the heliport at West 30th Street, hard against the elevated roadway. The small terminal building is in the far right-hand corner. Night lighting is installed

CURTISS PUSHER in the Air

BY MARK LAMBERT

No 137 of the Series

WE on *Flight* usually find that we have the opportunity of trying a new aircraft one or two years after we first describe it. With the Curtiss Pusher we must apologize for being about 52 years late. However, just to refresh the keen reader's mind, I will summarize some passages from the technical description of this interesting flying machine, in case they have slipped his memory. The account appears in the first volume of *Flight*, in the issue of July 3, 1909, and it remarks that "the Curtiss flyer is a biplane having two decks spaced five feet apart. . . . When at rest on the ground the chord of the decks is inclined at an angle of about 6° to the horizon, but this does not represent the horizontal flight position." Yes, I agree. In fact, there is nothing to represent its horizontal flight position, and that is one of the main difficulties in flying it.

Control is described in that early article as "much the same in its essential features as that of other machines of the type. Steering to the right or left is accomplished by a joint manipulation of the righting planes and the rudder, which may be employed either in the same or in opposite senses, according as it is required to increase or minimize the cant. Longitudinal oscillations are damped out by the elevator, and any tendency to capsize is checked by using the balancing planes. Ascent and descent automatically accompany variations in engine power, although the elevator can be used as a means of producing temporary jumps for adjusting the line of flight."

I take my hat off to the man who wrote this particular paragraph. It is almost uncannily accurate.

The weight breakdown then given was as follows. The bare engine (30 h.p. four-cylinder Curtiss) weighed 85lb, the magneto 12½lb and the radiator 40lb. With all accessories the engine weighed 192lb. Gross weight was 550lb (the original writer said "the weight of the machine mounted") which, less engine and the "mounted" 170lb pilot gave a bare structure weight of 188lb "an amount that ought to have given the constructors a fair chance of making a sound strong job of their work." I wonder if one would dare to write this of any present-day aircraft?

It is recorded in *Janes* of 1914 that Curtiss was given *carte blanche* early in 1908 to design an aircraft for the Aeronautical Society. He made a nose-and-tail biplane with his own four-cylinder engine, very rapidly built a second machine with a Vee-eight, also his own, and took it to Europe and won the Gordon Bennett trophy. These aircraft had foreplane elevators and rear-mounted rudder, but after the winning machine was brought back to the US, the foreplane was first shortened and then suppressed entirely in favour of the layout shown in the accompanying pictures.

It so happened that W. Bullock who learned to fly on this type in 1916 and spent many years as an airline captain, built a replica when he retired in 1947 in order to recapture the atmosphere of those pioneering days. The replica flew regularly and was later bought by Pete Bowers, well-known aircraft designer and builder, vintage enthusiast, glider instructor and aviation personality.

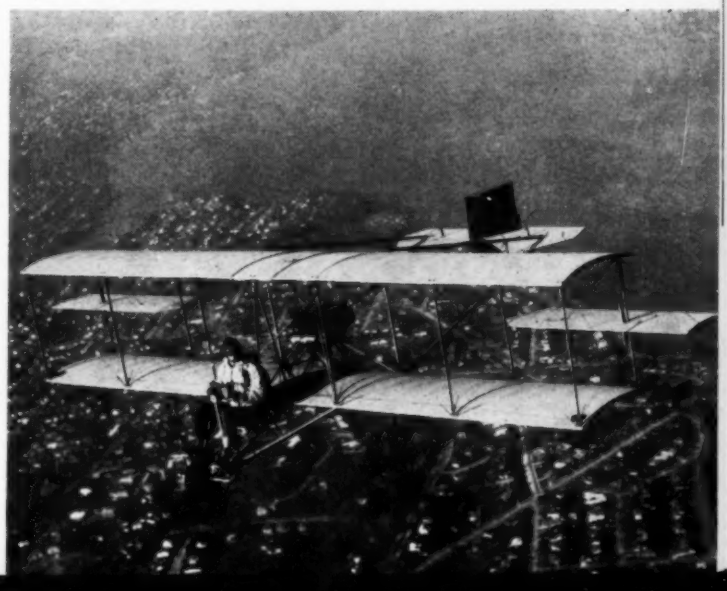
Pete learned to fly the Pusher really well. He has climbed it to something over 3,000ft, made flights of about 100 miles, given many demonstrations at air shows all over the US and still flies it regularly. It is one of several vintage or home-built aircraft which he flies from Boeing's runway at Renton, Seattle.

The Pusher replica is, as far as I know, dimensionally accurate, but made of steel tubes with "bird-cage density" wire bracing and powered by a 75 h.p. Continental flat-four engine and a wooden pusher propeller rather smaller than the original. The older wheels have been replaced by big doughnut tyres with toe-pedal-operated brakes on the main wheels. The nosewheel is fixed so that the only steering normally available is by applying one brake and perhaps a burst of throttle and scrubbing the front tyre into a very gentle turn. The toe-pedals are inboard of the rudder pedals. The ailerons, or "righting planes," are controlled from a handwheel on the control column: the throttle lever is on a strut beneath the pilot's left hip. A group of engine instruments is on a sloping panel by the pilot's right hip, together with an altimeter and a.s.i. The machine weighs about 1,100lb and the span of the wings is 26ft. The ailerons increase this to 31ft.

Quite apart from the fact that the Pusher is not really an aeroplane by modern handling standards, it has a peculiarity which considerably complicates matters. There is no visual reference in front of the pilot by which he can readily judge attitude in any plane. If the aircraft banks, the pilot tends to level his head and, Peter Bowers explained, only by looking at the outer wing-struts can a pilot assess bank attitude—or pitch. Being completely exposed, the engine makes a considerable din and half power sounds like full bore. The a.s.i. is generally well hidden beneath a flapping trouser leg. There is no perceptible natural stability and no control feel although the forces are fairly high. One is therefore flying the aircraft all the time, trying to prevent it doing what one cannot see it doing. It also responds to the slightest turbulence. Aileron movement is progressively restricted as the stick is moved forward or back.

Pete had the situation characteristically in hand on the sunny Saturday morning when he made me fly the Pusher. He first had the runway direction changed to face more directly into the light wind and then arranged to have the considerable light aircraft traffic stopped while I made straight hops down the runway towards Washington Lake. He showed me the throttle, stick and brakes and then climbed amongst the tail structure and swung the propeller. After some hesitation the engine caught and I waited for it to warm up. On a green light from the tower I was then cleared to taxy across the runway and up the taxyway to the take-off end. Following instructions, I aimed for the longest straight run, moved forward as far as possible and then stopped, put my feet down, carried the nose round and lined up for the

Pete Bowers, present owner of the Curtiss Pusher replica, shows that it can be done by flying over Seattle at over 3,000ft



CURTISS PUSHER in the Air . . .

Pete Bower, in amongst the tail, swings the pusher propeller

The nosewheel is fixed, so cornering is manual

Wait for that old tail-wheel job to get out of the way

No visual references for judging attitude . . .

. . . no stability, no aerodynamic feel . . .

. . . but it flies . . . I think

next straight run. Every time I passed through a puddle a small stream of water washed my pullover, but it was too much like manual labour to make dog-legs round puddles.

There was really no take-off check to make, except to fasten the seat belt; and this I did at the last moment to leave myself free for the "manual" cornering procedure. Having got the green light I moved on to the runway, close to the white centre-line, fastened the seat belt very tightly and opened the throttle to the 1,700 r.p.m. which Pete had said would do for the first hop.

I gathered speed, feeling for some "bite" in the elevator. Because the wheels are well aft of the c.g., the nose lifted all of a sudden and we left the ground, pushing the stick fully forward again to hold the attitude down. That first hop was really one mad struggle to see which way was up and then to keep the aircraft that way. Twice I clattered back on to the runway, but I was keen to commit myself to the air irrevocably, although this was mentally quite an effort. After the second thump I stayed up and had a little time to feel it out. I found that I had to concentrate so hard on following my nose down the runway, that I had no time to look at wing-tips or instruments or to consider any manœuvre other than staying level. The slipstream rushed refreshingly past my face, but every little eddy seemed to catch the machine and tip it this way or that. I had no idea of airspeed and the engine was making an even, frantic clatter behind me. I rocked along, up and down, about ten feet above the runway, feeling that at any moment it might just get away from me. I was using full control deflections in every axis, sometimes co-ordinated sometimes completely crossed. There was no aerodynamic feel whatsoever.

When I had been airborne for what seemed ages, the end of the runway hove dimly in view somewhere on the edge of my field of vision. I had to get down. But I was so busy keeping upright and airborne that the descent, even from a modest ten feet, seemed almost as difficult as a let-down from 40,000ft. I dare not glide, I had no idea how far I could push the nose down, nor what my attitude was relative to the ground. I just twiddled and fiddled it down, feeling for the ground, and finally bumped on the main wheels, noticing briefly that the nosewheel was still high in the air. Then I cut power slowly and braked to a halt.

Making the Century

This was probably my most exhilarating moment in ten years' flying, partly because this was my hundredth type and a good one for the occasion. I was over the initial astonishment and was beginning to enjoy it as I trundled back for another hop. The other light aircraft pilots taxying past were a little taken aback by the Pusher. They tended to run alongside me—little did they realize that I was quite incapable of making a quick turn on the ground, or even in the air. One man set up a sound movie camera and asked me to fly past close to him. I promised only that I would try. Finally a Piper taxied up alongside and the pilot yelled that I should use more power. Pete had asked the tower to relay this instruction by radio.

So I got another green light and lined up again, fastening my seat belt less fervently this time. I resolved to use a lot of power, try to glance at the a.s.i. at least once and make some S-bends. I even thought wildly of going out over the lake and turning round—the runway was hemmed in by hills and factory and did not leave room for a low-level circuit. Very few pilots have achieved a circuit on their first flight.

I got airborne with a lurch again and started my involuntary dance down the runway but this time I gained what seemed to be about 40ft of height. After a while I leaned over and glanced briefly at the a.s.i. It said 60 m.p.h.—enormously encouraging, but 20 m.p.h. optimistic, I was afterwards told. I tried a turn but the Pusher seemed so determined to roll right over that I levelled off after about ten degrees of turn. I did manage to fly almost over a photographer without flopping down on top of him, but the uncomfortable feel of the turn put paid to any idea of a circuit—especially over water. I sailed on, feeling steadily more confident, but finally struck turbulence from the Boeing factory buildings and then I had my hands full keeping upright again as well as judging the landing somewhere short of the lake. From about 20ft the let-down was again a problem, but a slight reduction in power seemed to do the trick and I touched down straight off the barest perceptible float.

I was really spoiling for a third run, but the local traffic had been so dislocated that the tower forbade it. After all, the Pusher took a long time traversing 5,000ft of runway. Pete Bowers shook hands and welcomed me to the fellowship of Curtiss pushers when I taxied in, we took many photographs and exchanged breathless first impressions with a knot of bystanders. I was all for a cup of something nourishing, but Pete first went off to collect his ancient Aeronca C.3 floatplane from the lake and landed it on its floats on the grass outside his hangar. The Pusher is not so exciting to him and he had to get the Aeronca back somehow.

HOWARD JOBMASTER in the Air

BY MARK LAMBERT

No 138 of the Series

SEATTLE, Washington, in the top left-hand corner of the United States, is right in the floatplane zone which extends up into and virtually right across Canada. It is hardly surprising therefore to find a great number and variety of floatplanes, both large and small, private and commercial. During my visit to the Boeing factory near Seattle I spent some time at the Northern end of the runway which stops on the shore as the southern tip of 15-mile-long Lake Washington. There is a long wooden ramp well filled with seaplanes and amongst these I was introduced to a most intriguing old-timer, the Howard DGA-15, which has been resuscitated on a commercial basis by Clayton Scott, chief of Boeing production flight testing. It was a sunny winter's day with a faint ripple on the water, just perfect for splashing about in floatplanes.

The Howard was originally designed before World War 2 by Ben Howard as a fast four-seat executive type, following a series of very successful racers. Several hundred were built for the US Navy and Army during World War 2 as transports, ambulances and instrument-flying trainers and many are still available. Even today it is quite a remarkable aircraft, very sturdy, with a big cabin, the universally popular 450 h.p. P & W Wasp and a top cruising speed of more than 150 m.p.h. What Clayton Scott did was to replace the fabric aft-fuselage covering with metal, fit a large, two-piece freight door to port to supplement the passenger and baggage doors to starboard, extend the cabin rearwards to make room for six seats and to have the aircraft certificated by the FAA for four sizes of Edo metal floats and an increased gross weight of 5,076lb. The largest of the four sets of floats, shown in the accompanying picture, is the 6470 size and provides exceptional rough-water and heavy load capability. Scott has called the Howard the Jobmaster and has formed the Jobmaster Co at 1016 First Avenue South, Seattle 4, Washington. He offers the complete certificated float conversion (with additional fins) and increased gross weight capability as a kit for $3,500 or a custom-built Jobmaster for $17,500. Eight Jobmasters, all on floats, have so far been sold.

Incidentally, the landplane version has a VNE of no less than 270 m.p.h. and is fully aerobatic. As a wartime instrument trainer it also had three sets of controls which must be almost unique. On size 4580 floats, the smallest offered, the Jobmaster has a useful load of 1,800lb and can carry six people for five hours or about 650 miles. Empty weight on wheels is 3,050lb and on small floats, 3,276lb. A total of 152 US gal of fuel is carried in three tanks beneath the cabin floor, there being a selector cock and a single gauge on which individual tank and oil contents can be read. The two water rudders are permanently in the main rudder cable circuit, spring links avoiding jamming of the whole system if ice freezes round the floats. Longitudinal trim is by v.i. tailplane controlled from a winding handle in the cabin roof. Tailplane angle is electrically indicated. The flaps are electrically operated and extend to 45°. The take-off setting of 22° is judged by fully deflecting one aileron and lining the flaps up with it visually.

The cabin is roomy enough to allow easy changing of places between any of the seats in flight. The two control wheels emerge from pistons in the panel which is recessed like an organ console to place the blind-flying instruments well forward. The Jobmaster I flew, registered N91J, carried Lear ADF, Narco Simplexer, Sunair HF and an MF receiver—pretty well all you need in the bush or on airways. Visibility from the pilots' seats was good, with the leading-edge only a short way ahead of the eyes and good visibility over the nose except when going on to or coming off the step on water. N91J had the large floats.

The controls had a fair amount of friction, especially the rudder with its circuitous cable runs, but on water the Jobmaster handled remarkably well. It could be taxied and turned accurately with 1,000 r.p.m. Minimum turning radius was about 30yd. Particularly good was the fact that the throttle could be opened wide and the Jobmaster would get up on to the step at 30 m.p.h. i.a.s. with the controls completely free. We were flying with full tanks and five occupants and therefore at gross weight or even slightly above. On the step, the Jobmaster could be driven around quite happily with plenty of visibility and steering to avoid unexpected obstacles. The water rudders were raised at these speeds, but aerodynamic rudder was effective.

I was told to pull off the water at 60 m.p.h. and we climbed at 500ft/min at 100 m.p.h. at 30in and 2,000 r.p.m. Noise level was pretty high, as one might expect from the large 9ft propeller and the frankly utilitarian amenities. I cruised at 2,000 r.p.m. and 29in (300 h.p.) and noted good control effectiveness, but a slight tendency to hunt longitudinally and soggy directional control. Going into a turn required a distinct sequence of rudder and then aileron movement, and was followed by a nose-down tendency and continued need for use of rudder if the slip ball was to be kept near central. It seemed to me that both cable friction and aerodynamic characteristics were playing their part in this behaviour. Control was not classic, but there was plenty of response in all three axes for throwing the aircraft around in confined spaces—an important point in bush flying.

Howard Jobmaster

(One P & W R-985 Wasp Junior giving 450 h.p.)

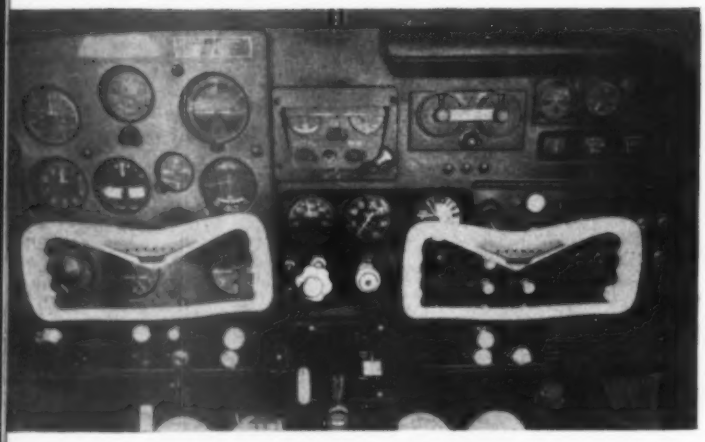
Span, 38ft; length over fuselage, 26ft; wing area, 210 sq ft; empty weight (wheels), 3,050lb; empty weight (small floats), 3,276lb; gross weight, 5,076lb; disposable load, on small floats, 1,800lb.

Performance: max speed, landplane, 175 m.p.h.; cruising speed, landplane, 154 m.p.h.; cruising speed, various floats, 120 to 130 m.p.h.; endurance, on floats, 5hr; range, on floats, 650 miles; service ceiling, landplane, 20,000ft.

Maximum flap speed was 105 m.p.h. and extension of half and then full flap caused firm nose-up trim changes which could be trimmed out with less than full tailplane travel. Closing the throttle caused the nose to drop quite sharply and we glided down, trimmed, at 80 m.p.h. at no less than 2,000ft/min. Trim changes after applying overshoot power in this condition and raising flap were considerable, but could be cancelled out.

I made two landings, picking paths more or less into wind, positioned to avoid islands, motor boats or some of the other floatplanes which seemed to be splashing about like happy wild ducks. The Jobmaster was very willing to go downhill and power was required to set up a comfortable descent at about 80 m.p.h. i.a.s. Close to the water I held off in normal landplane fashion and the aircraft simply bumped on to the water, settled in tail-down and dragged itself down to drifting speed very quickly. Surrounded as we were by naval, civil and manufacturers' airfields and by many other aircraft, we did not climb high enough to try stalls. We returned to land simply by running fast right up on to the sloping wooden ramp.

The handling characteristics at approach and cruising speeds were not exciting, probably because of the very large floats attached to a rather short-coupled aircraft, but the Jobmaster certainly seemed a capable and tough machine and it was exceptionally easy to handle on water. It is basically a strong, honest aircraft and its ability to take the Beaver ski or amphibious float gear, as well as several sizes of plain floats or wheels, makes it very versatile. I could not expect the Jobmaster to handle like a Chipmunk, but I certainly admire it as a workhorse.



Typical of powerplant control and instrument arrangements is this neat installation in the Cessna 210. On the left are the r.p.m. lever and tachometer, centrally placed are the throttle and boost gauge, and "the third instrument"—the fuel pressure gauge—is on the right. Its associated push-pull control is just beneath it

THE THIRD INSTRUMENT

A First Look at Fuel-injection Management

BY ALASTAIR PUGH

BRITISH pilots making an initial acquaintance with American light aircraft may be puzzled to see in some a "fuel pressure" instrument calibrated in lb/sq in, percentage power, and thousands of feet of altitude. Where this is fitted a third engine control supplements the throttle and propeller-control levers and the fuel pressure gauge is fitted in addition to the manifold pressure and tachometer instruments. In most installations, like that of the Cessna 210 shown above, these three controls and instruments are grouped neatly together on the "power section" of the instrument panel.

The clue to the function of the fuel-pressure control and its gauge lies in the absence of a mixture lever or a carburettor-heat shutter; it is an addendum to the operation of Continental fuel-injection engines. Quite a variety of imported US types are thus equipped, and it is Continental fuel-injection engines that will be used on the British-built Short Skyvan and on the Beagle Executive. The announcement on November 1 that engines in the Continental range are to be built by Rolls-Royce adds particular interest to the method adopted for controlling the flow of fuel, since it might be felt after reading what follows that better methods can be devised than those now universally adopted for Continental fuel-injection engines by American light aircraft manufacturers.

The advantages of fuel injection are too widely recognized to require more than brief repetition: carburettor icing troubles are eliminated; fuel distribution at altitude is better, so that economy and smooth-running are improved, and the fuel pressure gauge provides an indication of the actual fuel consumption. By reference to manufacturers' figures, it is possible to set up exactly the correct mixture strength at any flight condition.

Correct fuel-air mixture strength depends upon three variables —the percentage of power being extracted from the engine (controlled by manifold pressure and the r.p.m. setting of the constant-speed propeller), altitude and temperature. To set up the absolutely correct fuel flow for any combination of these conditions, some form of computer is necessary, and with every Beech, Bellanca or Cessna aircraft equipped with a fuel-injection engine is supplied a circular slide-rule computer similar to that shown in the photograph on the opposite page.

Computing mixture strength in this way may sound rather complex, a poor return for the type of mixture control associated with a fixed-pitch propeller, where mixture is leaned-off with altitude until the revs drop, and then inched back until the engine again runs smoothly. But the fact that a computer is supplied at all makes fuel-pressure control sound very much more complicated than it really is. If small variations from correct fuel consumption can be tolerated, arbitrary fuel-pressure control settings can be memorized and are quite satisfactory. It is for this reason that the fuel pressure instrument is calibrated in percentage power and thousands of feet of altitude; provided a typical climbing and cruising percentage power is memorized in terms of so many r.p.m. and so much manifold pressure, the fuel pressure control can be adjusted to a reading very close to the absolutely correct one by reference to the instrument. To help with this process, fuel pressure gauges in the 1961 Cessnas are to be calibrated in terms of gallons per hour.

However, there must be many pilots who, using a guesstimating system, feel uneasy that they are either not extracting optimum performance or not getting optimum fuel consumption from their engine, or who are worried that, by departing from known settings, they may be damaging the power unit by running it too rich or too weak. A few sums on a computer will show the order of the variations which occur when the fuel-pressure control is used in an arbitrary fashion. They are set down here in terms of examples worked out for a Cessna 310 fitted with two Continental IO-470-D engines. Answers are given in the tables and for quick reference the results are plotted as a series of graphs.

* * *

What happens if I set up my fuel pressure control for standard temperature and do not adjust it if the temperature varies from standard? Cruising conditions assumed are 5,000ft and 10,000ft at 2,300 r.p.m., and 22in manifold pressure.

At 5,000ft, 2,300 r.p.m., 22in manifold pressure:—

Temp dev't'n from standard (°C)	Corresponding %power	Fuel pressure (lb/sq in)	Consumption (gal/hr)	Deviation (gal/hr)
+30	60.5	6.2	22.7	−0.7
+20	61	6.3	23.0	−0.4
+10	61.5	6.4	23.2	−0.2
0	62	6.5	23.4	0
−10	62.5	6.6	23.6	+0.2
−20	63.5	6.6	23.7	+0.3
−30	64	6.7	23.9	+0.5

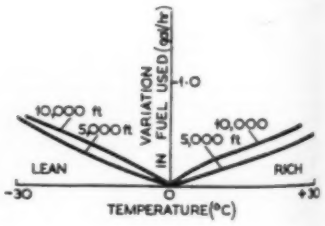
At 10,000ft, 2,300 r.p.m., 22in manifold pressure:—

+30	65	6.9	24.6	−0.7
+20	66	7.0	24.8	−0.5
+10	66	7.1	25	−0.3
0	67	7.1	25.3	0
−10	68	7.2	25.6	+0.3
−20	68	7.3	25.7	+0.4
−30	69	7.4	26	+0.7

Suppose that I take off with my fuel pressure control fully rich (i.e. max flow) and leave it there? How much fuel will I waste as I climb and how far incorrect will I be, assuming that I set up 2,300 r.p.m., 22in and fly in standard temperatures? (Max fuel pressure is assumed to be 10lb/sq in.)

Altitude	Correct fuel pressure (lb/sq in)	Correct consump'n (gal/hr)	% power	Actual consump'n (gal/hr)	Deviation (gal/hr)
1,000	6.1	22.4	59	32.5	10.1
2,000	6.2	22.6	60	32.5	9.9
3,000	6.3	22.9	61	32.5	9.6
4,000	6.4	23.1	62	32.5	9.4
5,000	6.5	23.4	62	32.5	9.1
6,000	6.6	23.6	63	32.5	8.9
7,000	6.7	24	64	32.5	8.5
8,000	6.9	24.5	65	32.5	8.0
9,000	7	24.9	66	32.5	7.6
10,000	7.2	25.3	67	32.5	7.2

The above technique is obviously very wasteful, but suppose I set my fuel pressure at an arbitrary 6.5lb/sq in while maintaining 2,300 r.p.m., 22in? How far incorrect will I be now?



The four graphs show, left to right, the effect on fuel consumption of: temperature variation; using fully rich mixture; climbing at a constant setting; and adjusting power

Alt.	Correct fuel pressure (lb/sq in)	Correct con-sump'n (gal/hr)	% power	Actual gal/hr	Actual power per cent	Deviation* (gal/hr)	
						rich	lean
			theo-retical		nominal		
1,000	6.1	22.4	59	23.4	62	1	
2,000	6.2	22.6	60	23.4	62	0.8	
3,000	6.3	22.9	61	23.4	62	0.5	
4,000	6.4	23.1	62	23.4	62	0.3	
5,000	6.5	23.4	62	23.4	62	0	0
6,000	6.6	23.6	63	23.4	62		0.2
7,000	6.7	24	64	23.4	62		0.6
8,000	6.9	24.5	65	23.4	62		1.1
9,000	7	24.9	66	23.4	62		1.5
10,000	7.2	25.3	67	23.4	62		1.9

*normal lean mixture

Another technique that I might adopt—it is recommended by some aircraft manufacturers—is to operate at constant power. If I select 2,300 r.p.m. and 60 per cent power, I know that my fuel consumption will be 22.6 gal/hr *at any altitude*. On the other hand I shall have to adjust manifold pressure in the following way:

Altitude	Manifold pressure (in)
2,000	22
4,000	21.5
6,000	21
8,000	21
10,000	20.5

This adjustment keeps *power* constant, but to keep fuel-flow constant (since the throttle also regulates flow through the injector nozzles) I must constantly pull back on the fuel-pressure control to maintain 6.5lb/sq in on the gauge. Suppose now that I open the throttle and climb from 3,000ft using a typical climb power setting of 2,450 r.p.m. and 24in? If I level out at 6,000ft, having maintained 6.5lb/sq in fuel pressure, how far incorrect will be my fuel flow?

Altitude	Correct fuel pressure*	Correct fuel consumption	Actual fuel consumption	Deviation (lean) gal/hr
3,000	8.1	28	22.6	5.4
4,000	8.2	28.4	22.6	5.8
5,000	8.4	28.6	22.6	6.0
6,000	8.5	29.0	22.6	6.4

*normal lean mixture

This is obviously flying on a very lean mixture, so that I must increase fuel pressure to suit. The rule-of-the-thumb way of doing this is to appreciate that 2,450/24in is about 75 per cent power and that this corresponds to a normal lean mixture fuel-pressure setting of 8.2lb/sq in. If this pressure is held, mixture strength will remain correct *throughout* the climb, but manifold pressure must be adjusted by opening the throttle to maintain 70 per cent power. Because of the interdependence between throttle position and fuel pressure, the fuel control will have to be pulled *back* to keep injection pressure constant. Of course, in the example below, a manifold pressure of 22in Hg could not be maintained up to 10,000ft; full throttle height would be reached far below. But for convenience such practical considerations have been ignored.

Climb at 70 per cent power: 2,400 r.p.m. and 24in. at sea level:—

Altitude (ft)	Manifold pressure (in)
0	24
2,000	23.5
4,000	23.5
6,000	23.0
8,000	22.5
10,000	22.0

The variation of manifold pressure setting then, is quite small—as a rule-of-thumb about 1lb/sq in between sea level and 5,000ft and another between 5,000ft and 10,000ft. Nothing has been said about descent, because the conditions which then apply are the exact reverse of those pertaining on the climb. The danger is that the mixture will become over-lean, and to guard against this the fuel-pressure control must be pushed forwards as the throttle is closed.

The computer—an essential adjunct to fuel control management. A distance-fuel-TAS scale is on the reverse

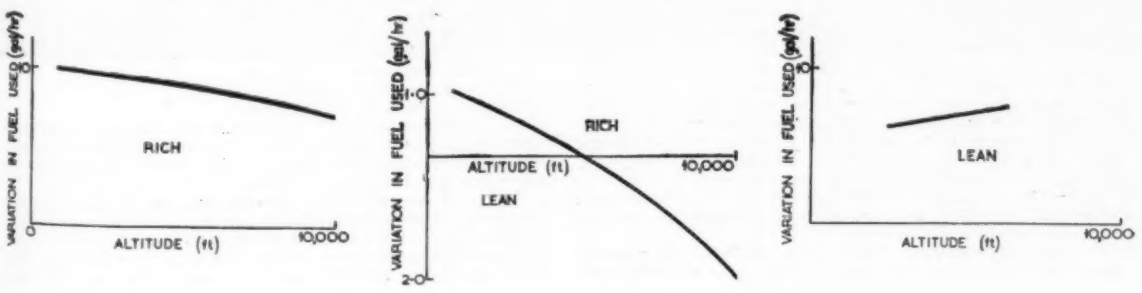
From these examples a number of facts emerge:—

- Temperature variations can be virtually ignored, although correct adjustment is to lean (reduce pressure) slightly in summer and richen in the colder, denser air of winter.
- If cruise settings corresponding to particular percentage powers are memorized, fuel pressure—and thus fuel consumption—can be held constant at any height. Only manifold pressure need then be adjusted, by a reduction of about 1in for every 5,000ft of height.
- To climb on a fully rich mixture not only wastes fuel but could affect smooth running.
- For range or endurance flying, or for flying at the correct maximum lean mixture, reference must be made to the aircraft manual or to a computer.

The last of these conclusions really expresses the crux of the whole matter: for really precise control some form of calculator is required.

What about automatic control? Presumably it has not so far been fitted to US-built light aircraft on grounds of complication and expense, and because in any case some form of manual trimmer would be required to obtain extra-lean mixtures. But, because the trend in light aircraft—indeed in all engineering—should be towards simplification, it ought to be well worth while tackling automatic control now, so that it could be included in British aircraft equipped with Rolls-Royce Continental engines. Perhaps what is needed is simply a constant-power device that measures the physical displacement of the r.p.m. and throttle levers and adjusts the output in relation to pressure altitude. The mixture lever would then be used to adjust for temperature and for extra-lean mixtures. Perhaps by relating the present variables of fuel pressure and boost to r.p.m., and biasing them against temperature, the fuel-pressure control need have only an altitude scale, and the mixture control would be used only to adjust the needle according to the height recorded on the aircraft altimeter. Perhaps the whole device should be fully automatic, sensing as well exhaust back pressure, and relieving the pilot of this management responsibility entirely.

Whatever cheap and simple solution can be found, something really does appear to be needed. Nor is the market a small one; in round figures something like 5,000 Continental fuel-injection engines should be sold next year; a large number of others are already in service.



HUNTING WITH THE VIXENS

In at the Firestreak "Kill" with a Hunter T.8

FOLLOWING his air-to-air studies of DH Sea Vixens ("Chasing the She-Fox," October 14), "Flight" photographer Ian Macdonald was invited to take exclusive pictures of Firestreak firings by Sea Vixens of 890 Sqn, Fleet Air Arm. Two of the results are published here—the first studies of the Sea Vixen/Firestreak weapon system in action; and with them is Macdonald's own story, showing how many imponderables an air-to-air photographer has to reconcile to get his pictures. The difference in performance between the Hunter T.8 and the Sea Vixen is a case in point, the explanation here being the relatively low thrust (8,000lb) of the Rolls-Royce Avon in the Hunter. The more powerful versions of this aircraft, of course, have "five-figure" Avons. This was the first full-scale Naval training firing of Firestreak, and the Admiralty have reported an 80 per cent success.

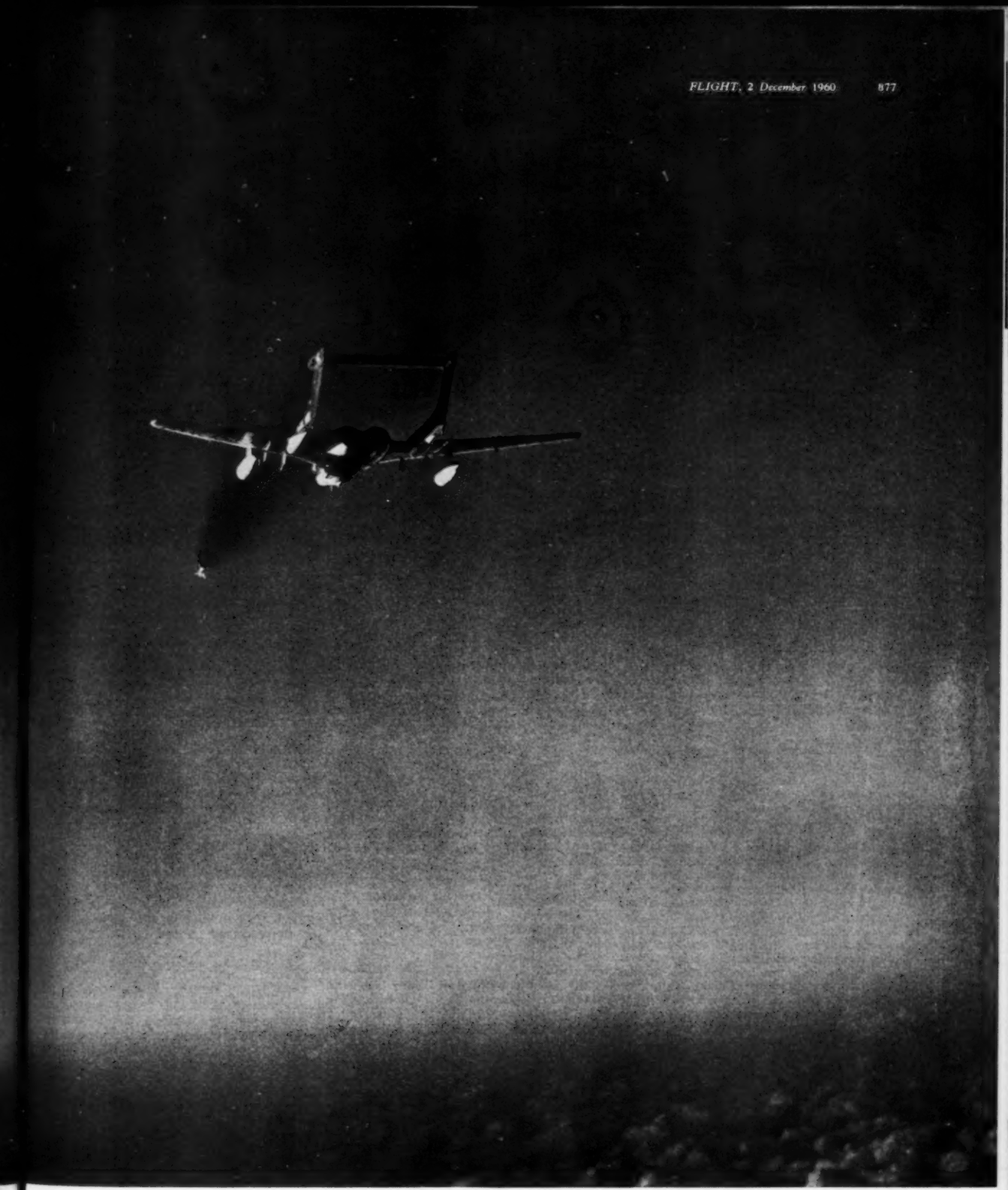
THE purpose of my visit to RNAS Yeovilton, in Somerset, was to obtain photographs of Firestreak firings from Sea Vixens of 890 Sqn, embarked in HMS *Hermes*. Numerous foreseen difficulties, however, made this no ordinary assignment; and it was a rather worried *Flight* photographer who presented himself at Yeovilton. Past experience had proved that the most essential part of any photographic sortie is a thorough pre-flight briefing; but as personal contact with the Vixen squadron was impossible in this instance, plans were laid through a series of signals to *Hermes*, and to the range control at Aberporth. All this had preceded my arrival, and had been organized by Cdr N. Perrett, MBE, Commander Air at Yeovilton. My pilot during the sorties was to be Lt Simon Idiens, of 766B Sea Vixen Sqn, and our photographic aircraft a Hunter T.8.

Photography had to be of secondary importance; at no time must it interfere with the firing programme. Many problems had to be faced, the first being that no direct communication with the Sea Vixens would be possible as these aircraft have UHF radio, whereas the Hunter is fitted with VHF. It was therefore agreed that we would have the Vixen pilot's instructions relayed from Aberporth control. They would give us a five-minute warning call, and one every minute after, until the all-important count-down from five seconds, and finally "clear to fire." By that time Lt Idiens hoped to have the Hunter in a suitable position; the rest would be up to me.

This all seemed pretty straightforward, but allowances had to be made for the relative speeds of the two aircraft. Should the Vixen—during the final minutes before firing—have to accelerate, then almost certainly we would be left behind as distant spectators in a deadly sport, and miss the kill. Requests were made to *Hermes* for the Vixen pilots to bear in mind the Hunter's performance and, circumstances permitting, allow us to stay with them. It was decided that Lt Idiens would make a preliminary flight to check the special frequency fitted in our aircraft, necessary for contact with Aberporth. This accomplished, no more could be done on our part, it seemed; and it was a pretty confident camera crew which arrived at RNAS Brawdy in Pembrokeshire. We were to be based there during the operations, and were to fly only when requested by *Hermes*. It had previously been agreed that we would not participate in the exercise until the Vixens had made their first kill.

The following morning at 0800hr I made final checks on my camera equipment (never had these been so important, or executed so thoroughly), and with Lt Idiens reported to the control tower to await instructions from *Hermes*. At 1000hr the signal arrived confirming the first attempt as successful, and allowing us to join in the fun on the next sortie, scheduled for 1130hr. Photographic conditions were perfect as we took off, and after orbiting the firing area for some minutes we were informed that our "Playmate" (this was the Vixen's call-sign) was airborne; then, assisted by control at Aberporth, we made our interception. As we formated on the Vixen, skilful positioning by Lt Idiens allowed us to secure several good portraits of the Firestreak and decide on the best angle from which to photograph the actual firing. We soon had the first warning message —that the Vixen had started his live run and would release the missile in five minutes. Formating in line astern, camera at the ready, we listened as the other pilot kept us in the picture, and only hoped that we could do the same for him. The positioning remained perfect for the next two minutes; but then, as we had feared, the distance between the two aircraft increased. Although we sustained maximum speed in the Hunter, we were some 400yd astern as the missile was fired. Even from that distance, although impossible to record photographically, it was an impressive sight. In a matter of seconds the Firestreak had homed on its trajectory and the Meteor target was destroyed.

Frustrated, we returned to Brawdy and told *Hermes* that our attempt had been unsuccessful, requesting permission to fly with the next sortie. This was granted, and after a quick lunch we took off determined to improve on the morning's performance. But it was not to be. We experienced the same difficulties, and once



again returned to base with nothing to show for our efforts. It was now mid-afternoon, and although photographic conditions were deteriorating rapidly, it was decided that a final attempt would be made that day. There was no alternative but to repeat our previous tactics, and with a great deal of finger-crossing and all that goes with it, we again formated in line astern. At last our luck changed, and we were reasonably positioned when the missile was launched—close enough in fact to spot the Meteor target in the distance. As soon as I had pressed the shutter, Lt Idiens pulled the Hunter up hard to starboard, avoiding any possible contact with parts of the target that might be scattered around the area.

Back at Yeovilton, the inevitable questions popped up: "Did you get it?" "Was it worth while?" I could only answer at that stage that I hoped the results would be worth the considerable effort of all those involved, and that any improvements could have been achieved only by using a photographic aircraft with a greater speed range.

I. M.

Straight and Level

HOW effective are the Ministry of Aviation's jet-noise monitoring points at London Airport? Can they, like income tax, be dodged?

It seems that they can, and are. Here is an illuminating little extract from a magazine article by a pilot concerning the flight planning of a 707 take-off from London: *"There was some talk of a decibel measuring truck being half a mile or so beyond the end of the take-off runway and that an early turn was desirable."*

The flight number, date, airline, name of the captain, etc, are all available in . . . well, if the Ministry are interested, I can supply them with the reference.

● The other day BOAC Britannia 102 G-ANBC suffered a failure of its hydraulic system and had to make a belly landing at Khartoum. It was very badly damaged, though I am glad to say that nobody was hurt.

If *only* this could have happened (if it had to happen at all) to a Britannia other than G-ANBC. It was this same aircraft which was very badly damaged at Rangoon in September 1958. A whole year's work was lovingly lavished upon it, first at Rangoon and later back at Bristol, to make it airworthy again. I know Bristol got paid their money but —well, I just wish it hadn't been old Bravo Charlie.

● Defending, in the House of Lords, the Government's decision to make the British taxpayer subsidize Cunard's new *Queen Mary* replacement, Lord Mills says on behalf of the Government:—

"My Lords, what were the reasons for proposing the construction of this ship, and why did the Government decide to subsidize it to the extent of some £3¼ million? The reasons were these. There is something in prestige, but that is not the whole story. So far as any calculation can be made ahead, it was felt that ten years was as far as anybody would look in advising about this matter, in view of the changes in the transport field. It is true that air transport is going up at a greater rate—a much greater rate—than sea transport. But sea transport is going up, too . . ."

Steady on. The fact is that sea traffic on the North Atlantic—the route for which this new ship is intended—went *down* last year, down by 7½ per cent.

In my view a subsidy for this ship would have been a scandal even if North Atlantic sea traffic *had* increased last year. The future is in air transport (and you know I have no axe to grind). It would have been a greater scandal had this ship been subsidized on the frank admission that sea traffic is declining. But to subsidize it on the basis of figures that are 180 to the facts is, to put it mildly, worthy of a strong piece for Straight and Level. I must write one.

● It was proposed some time ago that, to ensure the "continued competency" of airline pilots, a squad of flight inspectors should be formed by the Ministry of Aviation. Here is an extract from a recent Ministry advertisement:—

"At least three posts for men or women of good general education, normally with School Certificate or equivalent, to act as Flight Operations Inspectors. Considerable flying involved. Age: at least 23 on 1/9/60. Candidates must have had recent experience as pilot in civil air transport, and have held Airline Transport Pilot's or Senior Commercial Pilot's Licence, but exceptionally, extensive flying and considerable recent experience in other operation fields of aviation may be accepted instead."

The prospect of a 23-year-old pilot sitting in judgment on a 15,000hr veteran of 43 is not one that BOAC, BEA or independent skippers anticipate with much pleasure.

I should have thought that the best source of recruitment for such a police force would be from among practising airline pilots, who would exchange their employer's uniform for a helmet, big boots, etc, to do a tour of duty—for perhaps a few weeks of each year—as Ministry inspectors.

● Once again Brab thunders away, trying to put wrongs to right—this time on BBC *Panorama* in the JP.4-kerosine controversy. Whether he is right or wrong—and I'm sure he is right—here is somebody who fears not to break the timorous silence which seems to have descended over British aviation, an industry whose freedom of speech, because so many people in it are so scared of offending the omnipotent Minister, is so lacking these days.

Passing thought: We can be sure, I think, that the Air Registration Board, of which Lord Brabazon is chairman, agrees with his views on JP.4. If not, this responsible body would surely have advised him that he was making an untoward fuss. If this is so, may we now expect the ARB to rule that the use of JP.4 will invalidate the airworthiness type certificates that it issues?

The caption supplied with this agency picture informs me: "Paris: A young Frenchman, 19 years old, Philippe Arnal, son of a police officer, in company with several friends, invented a new missile shown here. This missile has a range of twenty thousand meters. Its speed would be of seven hundred meters per second. Our pictures show," continues the caption, "Philippe Arnal (tallest) with his friend Jean-Pierre Gliksman-Shotland in their laboratory at Puyeaux, near Paris." Hélas, le pauvre Jean-Pierre

● Pratt & Whitney are claiming to power "nine out of ten modern commercial jetliners." I suppose it all depends on what you consider modern; but even if my Hartford friends rule out the Comet, Caravelle, BB-152, Tu-104 and Tu-124, there are still the CV-880, 600 (and 990).

● "There has been some criticism of the appointments to the new Air Transport Licensing Board," says Mr C. J. Stevens, chairman of BKS and president of the British Independent Air Transport Association. "But we concur with its make-up. After all, as a potential applicant, you can't expect me to say anything else."

● A certain European airline has been receiving complaints that its stewardesses have not been quite so friendly and helpful to passengers as they used to be.

Asked about this the general manager replied: "They are always very friendly and helpful to me."

ROGER BACON

Here is No X in my "Life Goes On" series: the Helmy Aerogypt G-AFFG of 1939 in use as a chicken house in a garden at Woodley, where it was installed after the aircraft crashed at Northolt in 1947. The wings are said to be still in store in the attic of the house, though I believe that since this was taken the fuselage has been removed

Auster Alpine Foxtrot Whisky, vehicle for the flight to Nepal, is given a critical Indian inspection at Allahabad

AUSTER TO EVEREST

The Oxford and Cambridge Flight to Nepal

THREE undergraduates, David Lomax of Brasenose College, Oxford, John Brown of Christ's College, Cambridge, and Dermot Boyle of Hertford College, Oxford, flew an Auster Alpine from Cambridge to Nepal and back in September. Their trip, costing approximately £995, had as one of its six aims "to prove that air touring is safe, economical and enjoyable." The leader, David Lomax, shows in his account of their adventures that this aim, at least, seems to have been fulfilled.

BY DAVID LOMAX

OUR crew was three. I was captain, John Brown of Christ's College, Cambridge, co-pilot, and behind us, with his knees always drawn up uncomfortably on all our gear, the navigator who kept the peace, Dermot Boyle of Hertford College, Oxford. Contrary to all the predictions of our friends with whom we trained as pilots during National Service in Canada we have just returned to university after flying an Auster Alpine, G-APFW, to Nepal and back in six weeks.

There may be some who say that to fly a single-engined light aircraft, 100lb overweight, without navigational aids, parachutes or dinghies across desert, mountains and 4,000 miles of sea, in all, is asking for some sort of trouble. Well of course it is, but those people, perhaps, in this jet-age have forgotten the joy of the skill of personal flying. I am happy to say, much to the disappointment of the Press who greeted us when we returned, that our Auster behaved herself perfectly at all times.

This does not mean, of course, that the flying business became boring or uneventful. Our difficulties started when we first thought of the idea, about four months before take-off. We wished to fly to Nepal to study the conditions of Tibetan refugees there and to see a part of the world we didn't know. We hoped to have quite unashamedly some real adventure in the process. Of course, as students, we could not possibly afford the cost of the expedition ourselves. The results of a brochure appeal for funds proved a valuable lesson in the futility of the battle between the enthusiasm of youth and the hard-headed philanthropy of the world of business. We saved hard, worked on labouring gangs, and, after receiving contributions from private individuals and a contract for feature articles, had just enough money to go—if nothing went wrong.

Then there was flight-planning. Here we received very much appreciated help from the Royal Aero Club, the Oxford and Cambridge University Air Squadrons, the RAF, the US Navy, Douglas Bader and Ranald Porteous of Austers. There were visas, carnets, maps and supplies to be collected. Somehow everything clicked into place but not before Geoffrey Yates of Grantair had paid us the supreme compliment of lending us an aircraft at a most reasonable rate.

On September 5 we took off from the Airport, Cambridge, petrifying our parents in doing so by the exuberance of a low pass. "Foxtrot Whisky" seemed somehow to be a most appropriate call-sign, and at the end of the first day out we decided to celebrate our confidence and a long leg down-wind of a 55kt mistral in the Rhone valley at a carnival near Marignane Airport, Marseilles. Next day we took off like a helicopter and spiralled over the water-skiers at Nice to 10,000ft with the splendid distraction of the Alps to port. Then on to a last-minute diversion in a thunderstorm to Pisa.

Our first scare, apart from a hasty diversion across the Appenines, was when flying from Rhodes to Cyprus. Here, if one is more than 15° off track, one has to face the prospect of ditching a fixed-undercarriage aircraft which loves to roll over on to its back. Dermot computed a heading from the met wind forecast at Rhodes and, whilst I flew on the instruments, John checked the compass. After about half an hour we found that a segment of the Turkish coast had loomed up in the purple haze ahead. Dermot shouted, "Hold her steady, drivers!" Then, holding his protractor against the perspex canopy he pin-pointed our position and, by using some special sacred navigational formula which pilots cannot understand, calculated a new course. We flew on and two and a half hours later Nicosia, as predicted, appeared under our nose. This was merely a small technical difficulty compared with what lay ahead.

In Beirut an Embassy official warned us that as the Jordanian Prime Minister had recently been assassinated and, on the previous day, a left-wing politician had been machine-gunned in a local vendetta, we might find that some of the countries in the Middle East over which we hoped to fly, would impede our progress for diplomatic reasons. One hour after we took off from Beirut someone threw a bomb into the Syrian legation. However, we managed to evade these political niceties and, after taxying past a row of Mig 17s at Damascus, were allowed by the police to leave the airport and visit the International Trade Fair. By the massive exhibits from the Soviet Union and the enormous Communist China stand we saw the tiny British contribution. Its centrepiece was a toy train operated by Foreign Office officials.

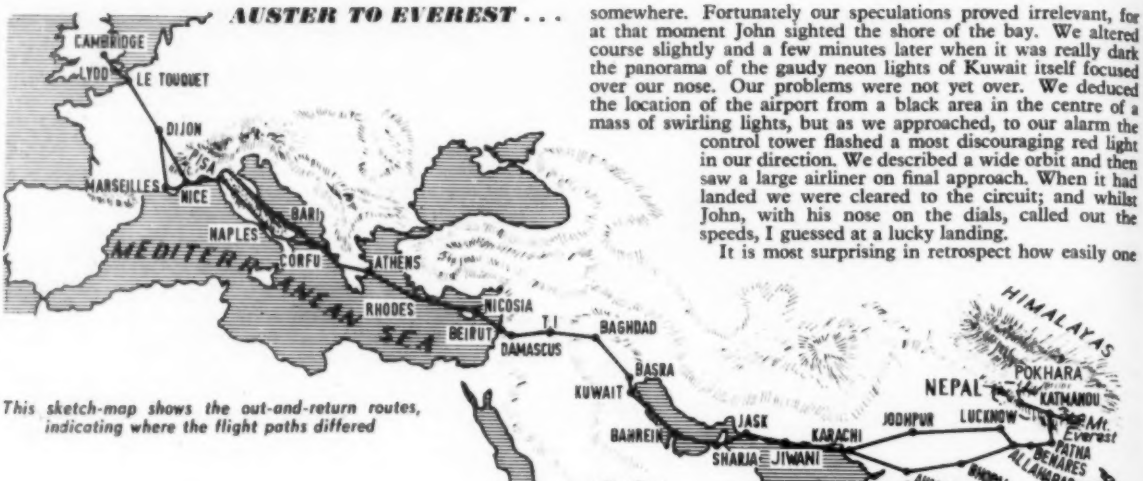
Next day we had our first taste of desert flying. Dermot looked brave about things and said, "We've just got to point Foxtrot Whisky at the pipeline, and hope for the best." An hour later we were still suspended in the bumpy haze looking at the desert ridges frantically for a sign of the East-West pipeline which would lead us to T.1, the Euphrates and Baghdad. It would have been easier if we had known what the pipeline looked like. We flew on for another 30 minutes whilst the fuel gauges relentlessly jiggled lower and lower. "Ten in the left tank, six in the right," John reported. "We have two gallons of water." He reached for the Desert Survival book and we all laughed a bit. Then I shouted: "We'll fly for another five minutes on this heading and if we don't see anything by then we'll turn due West and get out of here." The others agreed. Four minutes later we saw the pipeline, turned and followed it through a mild dust storm to T.1.

Tango One is the code name for a desert oil pipeline airfield owned by the Iraq Petroleum Co. The European maintenance engineers made us most welcome and showed us around the vast pumping houses and thundering machinery over which they have charge. The temperature in the pumping shed was a cosy 130°!

Here we had diplomatic trouble. The Iraqui soldiers armed with Russian carbines had not been informed of our approach, and, although we had written permission to fly through Iraq, they insisted that we stayed. Next day their commandant, an obese man, very highly decorated, summoned us to his office in the fort and informed us that, as a result of a telephone conversation with the authorities in Baghdad, permission had been given for the aircraft to pass through to Basra, but not for the crew!

After the frustrations of waiting for a whole day in uncertainty, of guarding Foxtrot Whisky from the curiosity of scores of Arab children and of protecting her from the ravenous sun with sacks and the moving shade of a small building, we were able to proceed. We took off from the oiled air strip and spiralled once more over the familiar desert khaki and the thin line which would lead us farther Eastwards. In the clarity of the early morning we flew over the Euphrates and wallowed in some steep turns whilst photographing its meanderings. Then on, past Habbaniya, to Baghdad. After circling the airport in a rather ostentatious way, because our radio was unserviceable, and failing to attract the comfort of a green light, we landed. There were explanations to be made for our surprise arrival. Whilst John filed a flight plan

AUSTER TO EVEREST . . .



This sketch-map shows the out-and-return routes, indicating where the flight paths differed

and Dermot studied our maps, I stepped out into the blinding sunlight and supervised refuelling.

Our greatest worry had proved up to now to be an unnecessary one: that of whether the aircraft was safe to fly still farther into what was for us the barren unknown. We need not have bothered, for even the fantastic heat which strained the fabric into vast reticulations and dangerous-looking bumps and forced us to use up lots of runway, showed its only effect in the way in which the aircraft flew left wing low until cooler temperatures allowed the rigging to resume its normal shape. A much more important problem was, of course, our own flying safety and morale, if you like. We did not have the time or more correctly the money to hang about like true tourists. We were becoming preoccupied with the neurosis of getting from A to B, we were tired with the many nights we had slept on seats in airport lounges, and our digestions were troubled by our ever-changing diet. It became no longer a case of some friends all together on a flying spree; and sometimes, I must admit, tempers became a little frayed. Somehow we found our way to Basra. The sultry air of the late afternoon hit us like a wall and I felt thankful that after nearly four hours of sweating under perspex over the vast flamingo swamps, I could at last uncoil my 6ft 5in and indulge in a cigarette! With overwhelming cordiality the authorities helped us through the various formalities. They, like everyone else, were astounded that Foxtrot Whisky should fall into the lowest category for landing fees. The average charge was 7s 6d for each landing.

With a meal inside us we were now ready for the next leg to Kuwait. If we had ever thought about it, of course, we should have remembered from the 4th form that the farther one goes East the earlier sets the sun. Somehow we overlooked this vital fact. Twenty minutes later our over-confident exit from Iraq seemed to be particularly foolish. We were at 500ft over featureless sand. We were not lost—merely unsure of exactly where we were. The radio was dead, the throttle wide open. All the time the sun was sinking with alarming rapidity. We had no lights of any kind whatsoever. "If we don't see the bay of Kuwait in ten minutes," I said, "we'll force-land in the desert whilst there's still some light." Then in the keenness of our agitation we saw a cluster of flame plumes from some oil wells way over to starboard. Perhaps these would be near a landing ground, or Kuwait or somewhere. Fortunately our speculations proved irrelevant, for at that moment John sighted the shore of the bay. We altered course slightly and a few minutes later when it was really dark the panorama of the gaudy neon lights of Kuwait itself focused over our nose. Our problems were not yet over. We deduced the location of the airport from a black area in the centre of a mass of swirling lights, but as we approached, to our alarm the control tower flashed a most discouraging red light in our direction. We described a wide orbit and then saw a large airliner on final approach. When it had landed we were cleared to the circuit; and whilst John, with his nose on the dials, called out the speeds, I guessed at a lucky landing.

It is most surprising in retrospect how easily one can forget an unpleasant experience, how quickly the lessons of the dangers of look-out complacency and rushing seem to disappear when one has two flat feet on the good earth! The process was accelerated by the charming hospitality of Cyril Criston, a Bristol helicopter pilot, and his manager, the phenomenal price of our hotel room—£4 5s. each—and our lessons in the unique dependence of the economy on oil. After a complete air-conditioned rest, Foxtrot Whisky received the very kind attentions of the local flying club, who miraculously manage to keep half-a-dozen Austers airworthy in a temperature of 100° and a relative humidity of 100 per cent! With the short-circuit in our radio repaired, we crammed our gear into the aircraft, fastened those detestable mae wests and set course for the shark seas and Bahrein.

Once airborne we never thought of what would have happened if that de Havilland Gipsy Major 10 had faltered. Its wonderfully monotonous tone instilled confidence into all of us. Of course, had anything gone wrong, we had a plan of frantic action. Dermot would have about five minutes to cut a gaping hole in the canopy above him with a ferocious knife he always carried. We would just have time to broadcast a frantic Mayday call and then ditch and hope that the satchets of US shark repellent and sea marker dye in our mae wests would work.

Of course nothing did go wrong. We droned over the wrinkling sea at 5,000ft with the mixture fully lean, and John and I took turns as always in performing the tasks of lookout, DI synchronization and instrument flying. It was always difficult to detect any defined horizon. The sea appeared to roll away in a series of blue-green gradations all around until it became indistinguishable from the sky. This lack of topographical detail gave Dermot the chance to sleep. He communicated with us by scruffy notes telling us, always with astonishing accuracy, our ETA, our position, how many beers he would have when this was all over and his annoyance when his pilots were more than one degree off heading. One note said, "Suggest that we apply to the Saudi Arabian Government for a deck-chair concession on those beaches below!"

"As far as the crowd were concerned, we were a sensation": Foxtrot Whisky after arrival at Katmandu, the end of the flight

Flying over the Persian Gulf, John Brown (left) in the co-pilot's seat and Dermot Boyle in the rear seat, absorbed in his navigational duties

The prim English voice of the controller at Bahrein picked us up at a range of about 40 miles, and some time later we circled the peninsula of Muhraq and landed in a nasty gusting crosswind on the enormous runway. We were very tired and with their customary hospitality the RAF took care of us and supplied the first comfortable bed we had seen since leaving home. Flt Lt "Rip" Kirby, a Twin Pioneer pilot, showed us round and then asked what route we were taking to reach Sharja the next day. "Straight across, of course!" "You're crazy," he said. "I always fly the long way round by the coast in case anything should happen." Unfortunately we couldn't afford the luxury of this precaution, for our range, our 5hr endurance, would not permit it. We were airborne next morning before sunrise and had to climb to 2,000ft before the sun could gild the palm trees behind us. We blocked out the rays with a map of Iraq and flew on guesswork and instruments for another three hours. Sometimes one of us imagined that he saw the passing shadow of a shark or sea snake, but most of the time there were no opportunities for indulging in fantasy. We flew and flew and flew, easing our cramped positions from time to time by wriggling deliciously in the latitude of a few inches. Eventually we made contact with the VDF of Sharja and after planing down under some low cloud and frightening some Arab dhows we circled over the mud huts of Dhubai and landed between a long line of markers on the sand. There is nothing at Sharja, as those servicemen who have been stationed there will admit with probable disgust. The horizon is a thin white line of sand, and the cluster of stone buildings a flamboyant intrusion on the desert scene. The RAF mechanics who viewed our machine with curiosity offered advice and help in correcting the tiny snags which were only obvious to their professional eyes. Our battery was almost dry and some screws on the cowling needed the turn of a screwdriver. Then after looking at the fort which had been built 30 years ago to protect the place from roving attacks by the bedouins we climbed the steps to the control tower.

Elusive Jask

Our next scheduled stop was to be Jiwani, but this would mean a leg of 410 miles over the sea, and we felt that it would be foolish to attempt such an uninhabited distance with so little margin for error. We asked about the possibility of landing for fuel at Jask, an airport marked on the map as lying opposite Sharja on the coast of southern Persia. Unfortunately the controller had as much information as we did—none! We decided to press on and, if Jask proved to be inhospitable after a low-level inspection, we would still have enough fuel to return to Sharja and think again. An hour later we were climbing once more over the desert, checking our heading by back bearings, until, at 10,000ft, we were crawling across the ragged jaws of the mountain range of Oman. On all sides there were rugged crags and razor-like fissures offering not a hope for a forced landing. The height of these mountains on the map is marked as just over 7,000ft, but Douglas Bader had warned us that they were more like 10,000ft. He was right. We now checked our position and altered heading as we coasted out. An hour later this mythical place Jask, with rather an alarming obstinacy, refused to appear. A large tanker was ploughing through the calm seas below us but we couldn't see any land.

One always realizes these things later but at the time we did not. We had been carried farther south by the wind changes of the venturi effect of the form of the coast and were forced to use precious fuel in turning north to reach the land once again. At last Jask emerged out of the haze. Feeling like real pioneers we twirled over the town, a miserable collection of mud huts, and searched around for a landing area. To the east there was a large expanse of what looked like fairly smooth gravel, a few scraggy camels and date palms and some obviously derelict buildings. "You just be careful," said John. "If we prang here the nearest Auster mechanic is a long way away and there isn't a British consul, you know!" I took control and after a low pass did a tolerable landing. We parked in the shade of a stone wall and shut off the engine thinking ourselves most lucky, for the diversion of our error over the gulf had cost us that quantity of fuel we might have needed to return to Sharja.

Nothing happened. The only sound was that of the booming of the ocean breakers a few yards away. After about a quarter of an hour the skyline was broken by a thin streak of dust from a jeep. It approached at an alarming speed, braked noisily and disgorged a load of children and officials. The first to speak to us wore a bush shirt and pyjama-type trousers and said over the top of his horn-rimmed glasses, "You English? Greetings!" It appeared from what he said that Jask had been a staging-post in the days when Imperial Airways used to fly those peculiarly ungainly aircraft to Australia; then it became a small RAF post during the war and since then has reverted to historical insignificance, a small fishing village on the banks of a sluggish creek. Occasionally it is visited by a postal Tri-Pacer from Bandar Abbas farther up the coast.

Refuelling here was quite ingenious. A large negroid man carried tins of fuel from a hut, punctured them with a screwdriver and poured the contents through a piece of chamois leather into the tanks. That evening we left these friendly people behind and crawled past the rock formations of Baluchistan to Jiwani, the western extremity of Pakistan. Then after a rest on the veranda of a Burmah Shell hut near the sea we collected the staff's mail and set off for Karachi and the real Continent.

If you arrive by Comet at Karachi and your pilot can select the correct airport from the variety which is presented to his view (some pilots these days do not seem to have that ability), you perhaps will miss the satisfaction we had of appearing intact over a huge land mass once more. Everything seemed to be on our side. The temperature had dropped considerably. We were hangared, refuelled and documented in a very efficient way and then with overwhelming hospitality shown round the city and entertained by the manager of Burmah Shell, Mike Newton, and his charming wife, Inga.

I could say much of what we saw or rather what we didn't see in our short stay and at our stops across India—Ahmedabad, Bhopal, Allahabad and Patna. At every opportunity we tried to discover as much as we could about what those people whom we met did and thought. But it was inevitable that dissatisfaction at the compulsory speed of our journey should become a sort of tourist malaise. We tried to see too much too quickly in too short a time, and anyway all airports (to which our budget usually confined us) look very much like each other!

At Patna it was difficult to realize that after crossing the desert, salt flats, jungles and plains thick with concentrated villages, of central India, the foothills of the Himalayas should be within range across the placid greenery of the Ganges valley. We said goodbye to our host, Brian Elliot of Burmah Shell, and, with the knowledge that cumulus cloud shrouded the hills ahead, set a heading towards its base.

Through the Gap

We had always observed the rule that when one has only a few fluctuating dials to fly on one must keep the ground in sight continuously. That is only fair to Dermot, and in any case there is that old flying adage: "If you know there are mountains 50 miles away and you happen to enter cloud, always assume that the mountains are 50 miles nearer than you know they are!" This did not bother us for the first hour. We wafted along, each carrying out the routine of our tasks or photographing the scenery or bringing our diary up to date. The cloud from the late monsoons had lifted only slightly, so it was at an altitude of 2,500ft that we first saw the hills. They were a purple band like a wall across our track, dissected by a series of scarred valleys each choked with viridian jungle. We identified our position as best we could from our small-scale map and decided to lunge through the gap which appeared directly ahead. Three hundred feet cleared the crags on the side of the ravine and then we were through to the other side; but here the position was much worse. We were below cloud at 3,000ft, gazing at a labyrinthine maze of fractured water courses, unmarked on the map and all leading up into the mountains and clouds on all sides. John flew, weaving Foxtrot Whisky from side to side so that we should see obstructions easily, whilst I kept a lookout for possible spaces for a landing. Several times after following the long funnel of a valley we found that it led upwards into cloud or southwards back to India, and had to retrace our course. After half an hour we soared over some thatched huts and cultivated slopes and saw the cloud lift slightly ahead, allowing a quick dash across a watershed into a large valley beyond. This was Katmandu, which we had waited so long to see.

The runway is a little intimidating—at both ends it drops away sharply. Along either side of it run two brick-walled monsoon drains about six feet wide and four feet deep, and at one corner a small thatched hut containing a radio acts as a control tower. Our landing was distinctly inauspicious. After a low pass, John

Groundcrew member at Tango One, landing-strip on the desert oil pipeline owned by the Iraq Petroleum Co

AUSTER TO EVEREST . . .

took control, and with the wind calm flew a standard circuit. As we floated over the runway whilst rounding out a sudden gust of truly Himalayan ferocity caught a wing. We touched, corrected, and, before I could grab the brake, careered off the tarmac in an ever-tightening turn. In the thin air of 5,000ft our tiny rudder had no effect, and centrifugal force or something caused the whole aircraft to lurch sickeningly over to starboard. All three of us threw our weight in the opposite direction and as the aircraft slewed to a halt with grass and mud sticking to the wheel hubs, we just managed to prevent her from tipping up on to a wing. We were four feet from the ditch but undamaged!

As far as the crowd were concerned, we were a sensation—the Dakotas of the Royal Nepalese Airline which trundle steadily in and out of Katmandu do not usually go in for that kind of aerobatic or rather acrobatic display. I must confess that as the crowd clustered around us we were conscious of some slight pride.

Here I owe an apology to Sir Alan Cobham. Whilst it is true that our Auster was the smallest aircraft to land in Nepal and the first direct flight from England to Nepal, there is no truth whatsoever in Press reports that ours was the longest flight in a light aircraft. We never said it and never believed it. I am sorry if the irresponsibility of the reports caused the rightful owner of that honour any embarrassment.

Nepal's Airfields

Perhaps I should say something about aviation in Nepal. There are eleven airfields in the country but only Katmandu is all-weather surface. The capital is served by DC-3s of Indian Airlines and Royal Nepalese Airlines. The captains of all these aircraft are Indians although a few Nepalese are being trained as co-pilots. No aircraft larger than a DC-3 can use any of the airfields. At Katmandu the peasants who used to use the landing-ground for grazing their sheep have not yet accustomed themselves to the dangers of aircraft. If a Dakota from India can find a hole in the clouds over the beacon through which to let down, a large siren is used to clear the runway of people and animals. Then with a power approach and the use of most of the 800yd runway the arrival screeches to a stop, backtracks, and is refuelled from large cans and a portable pump.

One day John and I and two Nepalese decided to fly to within sight of Everest. We took off and climbed in the valley to a height of over 10,000ft. The gigantic wall of the Himalayas, the face of the inscrutable god, was shrouded in a mass of boiling monsoon cloud, so rather reluctantly we returned to base, this time without incident. Then we obtained a quaint written permission to fly to Pokhara in the interior. John spoke to Capt King, the pilot of a DC-3 which was to take off in the next hour for Pokhara, asking him whether he could ride in the co-pilot's seat and take photographs of us in formation. Capt King agreed, and gave me a briefing. "You know the two little w's over there? Well, take the left one and steer 280. We'll meet you over the village of Gurkha at 7,500." That is what we did, and whilst we looked at the segments of the eternal snows to the north, John made facetious comments on the radio and tried to sicken his cargo of peasants and two pigs by performing steep turns around us. I suppose the passengers could hardly complain at this ludicrous situation, for they flew in an hour what would have taken them two weeks to walk.

Dermot and I appeared over Pokhara and its beautiful alpine lakes to see to our horror that the airstrip was covered with people and animals. This was a little disconcerting so we did a low pass over their heads to try to scare them; but it did not seem to have any effect so we prepared to land, hoping that they would become nimble in the face of approaching danger. Fortunately they were, although I could still see them fanning out ahead as I rounded out. They surrounded Foxtrot Whisky, eyeing her with curiosity until we returned to the capital later that day.

The story of our return to England is, of course, mainly repetitive. In any case we were over the hump and the dangers of the route did not appear so forbidding. However, opportunities for being foolish still presented themselves and we still took them! There was the time when we flew from Lucknow to Jodhpur in five hours, landing with hardly a teaspoonful of petrol in the tanks. Both the fuel gauges had registered empty for the last ten minutes over rocky desert. Then John fell ill with what an RAF doctor in Sharja suspected was malaria. Somehow, going back the way we had come seemed uneventful. We flew over the UAR without permission, looking everywhere for intercepters, who did not materialize. We met those pilots of 653 Light Aircraft Sqn in Cyprus who had been so kind on the outward journey, chatted with the navigators of 70 Sqn, who confessed that when we had last seen them the general consensus of opinion had been that we would not come back alive, and rested (whilst John recovered in hospital) at the kind invitation of the sergeants' mess. Then back to the miserable weather of Europe, its autumn warm fronts, rain and high winds. The last adventure was at Dijon.

Dermot had not been feeling well that day, but we were most reluctant to postpone our return; for, once before, our parents and the Press had gathered at Marshall's in vain when they did not receive our telegram informing them of the delay of John's illness in Cyprus. Dermot confessed that his illness, which he described as "tummy-runs," did not allow him the professional capacity of navigator, so John and I thumbed over the maps and tried to remember what we could of the rival skill of our dear companion. Then, fully confident in our ability, we set off for Le Touquet in a headwind blustering at 35kt and a ceiling of about 300ft. For hours we flew on over parts of France which looked most attractive but which we didn't recognize. Then when Soissons should have appeared in front of us we started to fly over a rather large town. Yes, there was the railway line and there the river; then the town got a bit larger. We flew on and on, then we both looked at each other and thought the same thing at the same time. We were right over Paris in a miserable drizzle at 500ft! Just time for a steep turn and get out to find a nice railway line to follow; that was much easier! Dermot, fortunately, was oblivious to all this incompetence.

Then, at last, England, Marshall's, and the usual weather, the worst we had experienced in the whole trip, parents admonishing our smoking-nerves, photographers and reporters and Geoffrey Yates whose unconcealed delight in the safe return of his aircraft was enough reward in itself. It was all over and we felt a little flat.

Next year Dermot and I want to fly Grandad round the periphery of the African continent, but this time a little more comfortably, a little faster and, who knows, a little more safely! He used to fly Avros in the thirties, so I suppose we shall have a ready-made co-pilot. In the meantime there is always the delight of the Chipmunks of the University Air Squadron. Even Dermot has applied for pilot training—anything, as my instructor says, "to get one's backside off the ground!"

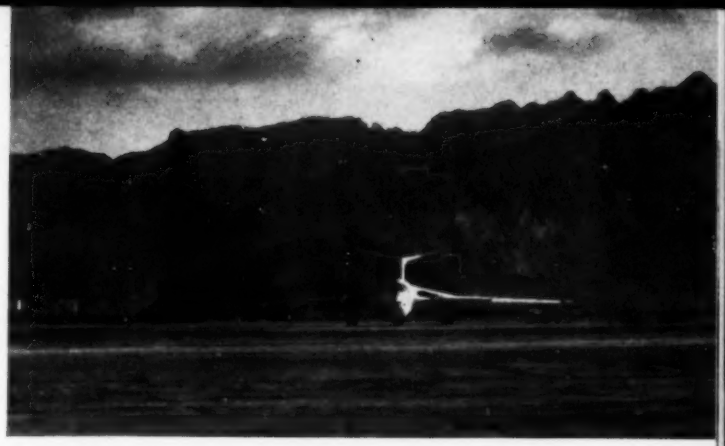
FORTHCOMING EVENTS

Dec. 2. RAeS: Lecture Theatre Opening Ceremony.
Dec. 2. BritIRE (South Midlands Section): "The Electric Rocket in Space Propulsion," by W. A. S. Murray.
Dec. 6. RAeS Astronautics and Guided Flight Section: "Solid-propellant Rocket Motors," by Dr G. H. S. Young and Dr W. R. Maxwell.
Dec. 7. RAeS Agricultural Aviation Group: "Grass, Soils and Fertilizers," by I. A. Nicholson.
Dec. 7. Guild of Air Pilots and Air Navigators: Livery Dinner.
Dec. 7. BritIRE (Radar Group): "Flight Evaluation of Airborne Electronic Equipment," by H. G. Hinckley.
Dec. 7. BritIRE (North Eastern Section): "Human Engineering," by S. G. Ramsay.
Dec. 7. Kronfeld Club: "Air Transport in Brazil," by W. N. Tonkyn.
Dec. 7. Institute of Welding: Conference on Welding Standardization.
Dec. 8. RAeS: Symposium on Supersonic Aircraft.
Dec. 9. RAeS Man-powered Aircraft Group: "Aerodynamic Problems of Man-powered Flight," by T. R. F. Nonweiler.
Dec. 12. RAeS Historical Group: "Some Problems of Aeronautical History," by C. H. Gibbs-Smith.
Dec. 14. RAeS Graduates' and Students' Section: "BOAC and the Future," by Charles Abell.
Dec. 14. Kronfeld Club: "I Declare Perranporth—You Navigate," by Ann Welch.
Dec. 14. Society of Instrument Technology: "Speed Control of Aircraft Gas Turbines for Jet Propulsion," by R. J. Walsh.
Dec. 15. RAeS: "Economic Lessons from Short-haul Airline Operations," by S. F. Wheatcroft.
Dec. 17. Institute of Aeronautical Sciences: Wright Brothers Lecture, Washington, DC.
Dec. 20. RAeS: "Aircraft Shapes and their Aerodynamics at Supersonic Speeds," by Dr D. Küchemann.

RAeS Branch Fixtures (to Dec. 9): Dec. 5, *Derby*, "The D.H.121," by C. T. Wilkins. Dec. 7, *Bristol*, joint meeting with Institute of Production Engineers; *Brough*, "Some Aeronautical Applications of Computers," by Dr S. H. Hollingdale; *Christchurch*, Film Show; *London Airport*, "The History of Silver City Car Ferry Operations," by Michael Day; *Swindon*, "Aircraft in the Modern Army," by Brig R. A. Fyffe; *Weybridge*, "Flying with the Trans-Antarctic Expedition," by Wg Cdr J. H. Lewis. Dec. 8, *Isle of Wight*, "Man-powered Flight," by B. S. Shenstone; *Southampton*, Young People's Lecture, by T. R. F. Nonweiler.

SERVICE AVIATION

Air Force, Naval and Army Flying News



Against a background of Aden mountains, a Handley Page Victor of No 57 Sqn awaits runway clearance during the Khormaksar display (see Col 1)

More RAAF Neptunes

A SECOND RAAF squadron, No 10, is to get Lockheed Neptunes for anti-submarine and reconnaissance duties. The aircraft, described as being of "a more advanced design that the P2V-5 Neptunes now based at Richmond, NSW," will replace the Avro Lincolns which have been operated by the unit. The new machines, 12 in all and costing about £4m, are scheduled to be delivered between January and April next year.

Khormaksar's Big Day

A CROWD of Wembley Stadium proportions—over 50,000 Arabs, Somalis, Yemenis, Indians and Europeans—poured into RAF Khormaksar last Friday (writes a correspondent) for the station's first-ever "at home." It was the greatest day in the entertainment history of Aden. Never before had so vast a crowd gathered to watch any event there. At one point in the afternoon, a nose-to-tail stream of traffic stretched eight miles from the gates of the station to the centre of Aden. All roads led to Khormaksar, and excited Arabs swarmed along them in a motley assortment of transport that included cars, buses, lorries, bicycles and camels.

The big show started with a bang—a supersonic one produced by a Hunter Mk 9 of No 8 Sqn. A Twin Pioneer of No 78 Sqn fired off coloured smoke grenades. A Valetta of No 233 Sqn dropped supplies with pink, orange and blue parachutes. A Shackleton of No 37 Sqn swooped low over the airfield to destroy a dummy submarine. Two Beverleys of No 84 Sqn dropped Land-Rovers and heavy equipment, followed by a detachment of parachute troops of No 45 Royal Marine Commando.

Highlight of the show was a display by a team of Hunters from No 208 Sqn, RAF Eastleigh, Kenya, official aerobatic team of British Forces Arabian Peninsula. It was a visual feast of thrilling and spectacular loops and rolls, climaxed by a downward bomb-burst.

There was an impressive low-level flypast by three V-bombers—a Vulcan of No 617 Sqn, a Valiant of No 214 Sqn and a Victor of No 57 Sqn. The display was brought to a close by two Sycamores of the station helicopter flight which flew slowly across the airfield towing the Union Jack and the flag of the Federated States of the Aden Protectorate.

The "at home" was in celebration of the twentieth anniversary of the Battle of Britain. It was decided to hold it in November because September is one of Aden's hottest months. Even so, it was a day of blazing sunshine, with a temperature of 85° in the shade.

Air Marshal A. D. Selway, Commander-in-Chief FEAF (left), who this month is visiting Australia and New Zealand, at RAAF Butterworth in Malaya with the Officer Commanding, Air Cdre G. C. Hartnell

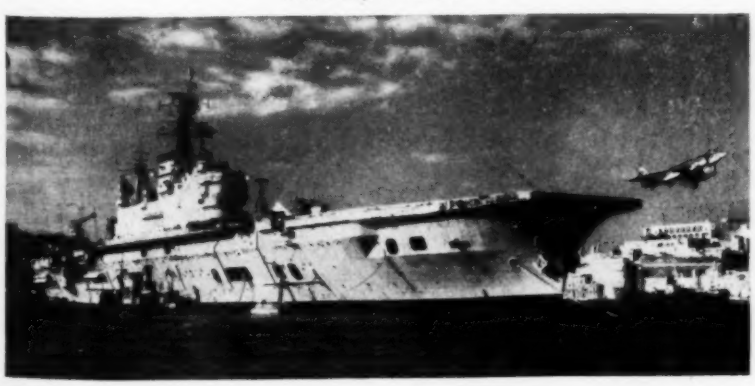
Beneficial Tasks

TWO RNZAF squadrons recently carried out unusual assignments, the story of which has been told in the autumn issue of *Air Power*, the Air Forces Quarterly. One of the squadrons, No 41, which operates from RAF Changi, Singapore, with Bristol Freighters, took school supplies from Singapore to Vientiane, the Laotian capital; and the other, No 5, which operates from the RNZAF maritime base at Luathala Bay, Fiji, has been assisting the New Zealand Department of Island Territories in its endeavours to improve the economic development of islands in the Tokelau and Cook groups.

The No 41 Sqn task was made tricky by the onset of the monsoon season. One of the aircraft managed to get in to the capital of Luang Prabang province with the airfield only marginally serviceable for Bristol Freighters and situated among high peaks; and the last delivery flight, to Xieng Khouang in the far north of the country close to the Communist Chinese border, took place only just in time, for as the aircraft returned to Vientiane the monsoon weather completely closed the four airfields from which the Freighters had operated. But at each of the centres, the supplies were in use in nearby schools the day after they had been delivered.

Following surveys to make sure of suitable alighting areas, the RNZAF Sunderlands of No 5 Sqn are to assist island development by flying pearl shells from Manihiki to the Tokelaus group, where a pearling industry is being established, and moving quantities of cone-shaped trochus (used for making buttons) from Fiji to Aitutaki and the Tokelaus.

A Supermarine Scimitar of No 807 Sqn taking off from HMS "Ark Royal" whilst the carrier lies at anchor in Grand Harbour, Malta. This was the first time a Scimitar had been launched from a ship in harbour



IN BRIEF

Two FAA pilots of No 738 Sqn, Lts G. Dobbie and M. Soper, ejected successfully when their Sea Hawks collided about five miles off the Scottish coast on November 24 and were brought back by helicopter to Lossiemouth. The Martin-Baker Aircraft Co Ltd have said that this brings to 400 the total number of successful ejections using their equipment.

The last organized National Service entry to the RAF, totalling 124 airmen, left Cardington last month for the School of Recruit Training at Bridgnorth, Salop. (About a dozen more NS airmen have been deferred on compassionate grounds and will report before the end of this year.)

A stone carving of the CFS badge has been presented to the Central Flying School at Little Rissington by the Commandant, Air Cdre J. N. H. Whitworth, as a parting gift. He is due to relinquish his command early next year. The carving, the first ever made in stone of an RAF unit badge, was placed in position for the recent visit by Queen Elizabeth the Queen Mother.

The RAAF has started a £50,000 programme to install speech recorders in airfield control towers at its bases in Australia and at Butterworth in Malaya. The Minister for Air (Mr F. M. Osborne) said that the new equipment would provide an accurate record of ATC instructions and aircraft transmissions, supplying details of vital importance to flight safety investigators in the event of accidents.

The Rietzke Award, for "the airman showing the greatest promise in the field of electronics," was presented to Sgt J. H. O. Willacy at RAF Cottesmore last Friday. It has been instituted by CREI (Capitol Radio Engineering Institute, Washington, DC) and is named after the institute's founder and president, Mr Eugene H. Reitzke. Runners-up were F/Sgt B. George and Cpl Tech J. Cumber of RAF North Luffenham.

Correspondence

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.

Fuel Duel

YOU have given generously of your space to those of us who advocate the exclusive use of kerosine fuel in civil turbine-powered aircraft. But, as you note in your leading article of October 21, the controversy has been entirely one-sided, and you make it clear that your columns are open also to "converts to JP.4." I must confess, sir, that I had already taken the liberty of suggesting to some of the JP.4-burning airlines that they would find hospitality in your journal if they would care to attempt a refutation of my article. Through the columns of another aeronautical journal I challenged the president of one of these airlines to produce evidence for some statements he had made in retort to Lord Brabazon, and I took care to ensure that the challenge was duly noted in the presidential office: it was not, alas, accepted. The JP.4 men are very keen to hide their light (or rather their fire) under a bushel.

Mr Hagrup (of SAS) was saying recently that it was impossible to tell whether one fuel could be safer than another. Your readers may be interested to know that I recently stumbled across some devastating evidence to show how contradictory an airline can be in this matter. In September 1957 there was convened in Stockholm a meeting to discuss turbine aircraft fuels. This was attended by the major oil companies and European airlines. It was chaired by Mr Hagrup's predecessor, a Mr Hagerup-Svendsen, the then deputy and vice-president, engineering and research. Having heard the evidence of the oil companies, Mr Hagerup-Svendsen, summing-up on the safety aspect on behalf of the airlines, said (I quote from the proceedings of that meeting): ". . . it did not take us a long time to decide that kerosine was the safer one (fuel)." I need hardly add that at that time it did not seem as though there was going to be any difference in price between the two fuels.

The real issue is one of hard cash, and Mr Piercy in his letter of November 11 asks: "Can an airline afford £x to save one human life?" (the unknown "x" depending on the basic assumptions). Although not myself an authority on airline economics, I would say the answer to this must be "yes" and for the following reason: whether they are wanted or not, no one now doubts the inevitability of supersonic aircraft, and that their introduction will be "regardless of economic consequences" (to quote Sir Matthew Slattery). If vast sums of money can be found for this, then a relatively modest continuing investment can be made to provide the safest fuel available for aircraft flying here and now.

It has long been apparent to me that this issue is not going to be resolved by technical argument, and I have therefore been attempting, unsuccessfully, to get into the daily Press. As you yourselves have noted, the air correspondents have shown little interest. I have my own ideas why this should be so.

Harpenden, Herts — J. W. RICKARD

Sticky End

WE British pilots are not alone in the problem of aerodromes and airports being closed ruthlessly regardless of the demand. Although two wrongs might not make a right, the blow may be softened with the knowledge that, according to a correspondent writing in *Flying*, during the last 15 years three airports within a ten-mile radius of Philadelphia, USA, have been closed. Apparently, at North Philadelphia Airport, a 5,000ft runway has been withdrawn from use because a candy factory is being built about half-a-mile from its end and the owner is anxious that aeroplanes should not fly over it!

Elstree, Herts — DAVID OGILVY

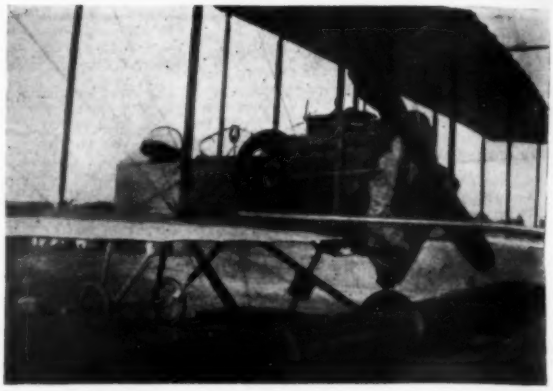
Don't Move Steps

IN reply to SAC M. J. Ody's remarks (November 18) about the positioning of the passenger steps on the King and Queen of Nepal's aircraft, I would like to point out that it's apparent the writer has never had any experience with the type of steps that were used, or with the Viscount 800.

If the steps had been in line with the exit, as he would have liked to have seen, the aircraft door would prevent the steps from going in close and would have left a gap between the steps and the aircraft, which would be dangerous for the passengers.

So may I suggest that if the writer ever applies for a job with an airline who use these types of steps and aircraft he had better wear a pair of spectacles as he suggests.

Gatwick Airport, Surrey — R. BOLDING



The early biplane referred to in the letter below from Mr R. Reynolds

Something Old out of India

A FRIEND recently gave me some old negatives which he exposed about fifty years ago while serving in India. For the most part they depict the usual faces and places, but I was particularly interested in two of the pictures [reproduced above.—Ed.]. They show views of what is apparently a British army aeroplane of the time. I would like to know more about this aircraft if you can identify it.

London N1 — R. REYNOLDS

[The aircraft is a Voisin and the pictures were taken less than 50 years ago. The spare wheel is of particular interest because this became a standard fitment on general-purpose aircraft of the RAF operating in the Middle East. Perhaps readers can give date and place.—Ed.]

Those Show Models

WITH reference to your correspondent's letter in the October 21 issue of *Flight*, I feel it is necessary to make the following points:—

In the first place, the caption with the photograph of the Avro 748 display unit [page 544, September 30] should have stated that Mastermodels Ltd had produced the largest amount of new models, at this year's SBAC show, the accent being on the word "new."

Certainly I would not suppose anyone to be too interested in who did what at this year's show; the comment was made in a letter to the editor accompanying the picture, and was published as a caption by the editor as an extract from it, although we have had no objections at all in his so doing, apart from the omission of the word "new." As a matter of fact, there was also in our letter a fair slice of praise to the editor and staff of *Flight* for the tremendously successful effort that must have gone into the extra large SBAC issue of the magazine, but modesty prevented him from publishing this!

As to the validity of any "claims," etc, our statement to the editor was based on the monetary values of all of the new models that appeared at this year's show. In this "calculation" no account was taken of the old models that appear every year, nor was it a question of sheer volume, such as in the case of someone producing a mass of lapel-badge-size models, which would not give a truly comparable picture. Coupled to the foregoing it would be only natural that the firm with the largest manufacturing capacity would produce the largest turnover of new models at an exhibition that uses a very high proportion of the kind of models that we specialize in.

It is not our intention to start a "we boast the most" campaign as we are sure that our many friends in the industry are well able to make their own selection as to the merits of this firm or that; however, should this "contest" gain in popularity, perhaps we will have another count-up next year.

Harrow, Middx — L. G. BARR, Director, Mastermodels Ltd

CORRESPONDENCE . . .

Porters and Traffic Clerks Only

DURING their long vacations many undergraduates try to take a preview of their possible careers by working for ten weeks or so in the industry of their choice. Many employers—including some aircraft manufacturers—recognize the value of this as a recruiting method, and as an opportunity to assess the capabilities of a man who one day may work for them, and offer the necessary short-term employment and training facilities. Unfortunately the airlines are not amongst these people.

I, and many of my friends, have tried to get work with airlines during our long vacations, but the only jobs we can get are as porters and traffic clerks. I would be the last person to deny the value of the customer-relations experience we would gain, but to someone who has spent two years in the manufacturing industry and a year at university, this is a little disheartening.

I personally applied to five airlines last summer, and was told by each that they could not spare the time to teach me a job if I was only going to be with them for such a short time. This is quite understandable, particularly at the height of the summer season; but there must surely be a constructive job needing very little teaching to someone with an engineering background.

Does this mean that the airlines do not wish to recruit graduates? It seems to me that there is here a considerable gap in our aviation training programme.

Clare College, Cambridge — A STUDENT OF AERONAUTICS

"The Flying Years"

NO doorpost can stand and do its duty without secure foundations and your correspondent (*Flight*, November 4) might consider that fact. The foundations of the aircraft industry were well and truly laid and surely the BBC should present the story correctly. It is as though *Flight* had said in the same issue that the rocket was a new factor in warfare, whereas I believe it was used before the machine gun.

Fairoaks Aerodrome, Surrey — CHARLIE DORENOKKER

MR G. DOORPOST'S letter in *Flight* (November 4) has, as I expected, induced many people to rush into print—I was almost tempted to do so myself, being in my own way a stickler for accuracy. But why bother, a doorpost is wood from the foot up and the obvious rejoinder is—put a door in it!

London W1 — LEONARD BRIDGMAN

Seven F-32s

WITH reference to Mr Schmidt's interesting letter about the Fokker F-32 (October 28), may I for the sake of history mention that there were at least seven F-32s.

These were (construction no followed by registration): 1201, NC124M; 1202, NC130M; 1203, NC333N; 1204, NC334N; 1205, NC335N; 1206, NC336N; 1207, NC342N.

Nos NC333N and NC334N were among those used by Western Air Express and they both passed to TWA.

London W14 — JOHN STROUD

THE INDUSTRY

Teddington Aircraft Controls Ltd have announced the appointment of Mr D. N. Steed to the main board of the company as works director.

Mr L. Coltman, formerly with Insulators Ltd, has joined the board of Moto Plastics Ltd.

Mr E. B. Thompson, sales manager, Ekco Electronics Ltd, has been elected chairman of the nucleonics group of the Scientific Instrument Manufacturers' Association.

Vickers-Armstrongs (Aircraft) Ltd have announced two appointments in the company's guided weapons department. Mr M. H. Still, MSc (Eng), AMIMechE, ACGI, has become deputy chief designer/weapon development; and Mr J. E. Daboo, BA, DCAe, AFRAeS, has been made assistant chief designer/weapons.

"Substantial orders" have been placed with Dowty Equipment of Canada Ltd by Lockheed Aircraft Co Ltd, under a production sharing arrangement, for the manufacture of nose landing gear for the F-104 Starfighter. Dowty Canada are also manufacturing nose gear for the RCAF version of the F-104 being built under licence by Canadair Ltd.

Ultra Electronics Ltd have appointed Mr D. E. Morris, formerly sales office manager with Nash & Thompson Ltd, as sales promotion officer. They also announce that Mr D. D. Keogh has joined the company as a project officer on the data processing group and Mr J. W. W. Beckett as a project officer with the communications group.

Mr A. S. D. Barrett, BSc (Eng), MIMechE, MIChemE, has been appointed consultant to Research & Control Instruments Ltd and has joined the board. Prior to setting up in private practice as an industrial consultant at the beginning of this year, he was technical director of Edwards High Vacuum Ltd.

Capt J. C. Harrington, OBE, formerly deputy operations director of BOAC and until recently general services manager of the Bristol Aircraft Co, has become a director of J. E. D. Williams & Co (Aviation Consultants) Ltd. He will be particularly concerned with developing the company's activities in consultancy and management services to the owners of business aircraft and executive fleets, and the procurement and disposal of aircraft.

An illustrated pamphlet on Impalco roll-welded heat transfer sheets has been published by Imperial Aluminium Co Ltd, PO Box 216, Witton, Birmingham 6.

Mr G. R. ("Bob") Hampshire, ARAeS, is joining Grantair Ltd from December 5 as chief engineer. He has been with the Pressed Steel Co Ltd at Kidlington as chief service inspector.

Mr N. A. Slater has been appointed commercial manager of the Pollard Ball & Roller Bearing Group of companies, and will be based at the group's Ferrybridge, Yorks, works.

An illustrated brochure, *Air Compressors for Industry*, has been published by B.E.N. Patents Ltd, High Wycombe, Bucks. The brochure, leaflet CB.193, illustrates a wide range of units with data on performance, pressure, h.p. requirements, air receiver capacity, dimensions and weight.

Southern Instruments Ltd, Frimley Road, Camberley, Surrey, have introduced a new scheme enabling comprehensive electronic instrumentation to be acquired on a rental basis. This scheme is operated by Southern Instruments' associated company, Instrument Rentals Ltd.

An information bulletin on DCMC industrial aerosols has been published by the Dudley Court Machine Co Ltd, 2a Parkhurst Road, London N7 (NORth 1639 and 2275). The range of these products includes aerosol-packaged colour-coding paints, and also degreasing fluid in similar form.

Details of Metox high-voltage resistors, developed in conjunction with the Atomic Energy Research Establishment, have been published in an illustrated leaflet by Welwyn Electric Ltd, Bedlington, Northumberland. The resistance element is a substantially thick film of metal-oxide material, and reliability and stability "better than on previously available carbon or wire-wound voltage resistors" is claimed.

A booklet has been produced by Solus-Schall Ltd reviewing the site methods of non-destructive testing provided by the company, including visual welding inspection, x-radiography, gamma radiography, penetrants, ultrasonic flaw detection and magnetic particle inspection. Copies of *Solus-Schall Inspection Service* are available from the company at County Building, Honeypot Lane, Stanmore, Middx.

A new toroidally wound ½A, 120W variable transformer—claimed to be the first of its kind in this field—has been developed by Philips and is being marketed in the UK by Research and Control Instruments Ltd, Instrument House, 207 King's Cross Road, London WC1. Known as type B8.709.59, it is designed for use on 220V or 240V 50c/s a.c. supplies, and will provide an output voltage continuously variable from zero up to 250V at a nominal current of 500mA.

Members of the board of Brooke Tool Automation Ltd, a new wholly owned subsidiary of the Brooke Tool Manufacturing Co Ltd, are Mr A. G. B. Owen, CBE, JP, chairman; Mr H. S. Holden, MIProdE, managing director; Mr H. H. Evans, MIProdE; Mr E. W. Hancock, OBE, MIMechE, Hon MIProdE; Mr E. W. B. Owen and Mr K. G. Walton. The new company will be responsible for the design, manufacture and technical sales of Brooke unit heads, special purpose unit machines and jigs and fixtures.

Vice-Admiral Sir Deric Holland-Martin (second from right), Flag Officer Air (Home), who recently visited Short Bros & Harland Ltd, is seen here inspecting a model layout of the company's main factory with (left to right), Capt H. St J. Fancourt, personal assistant to the chairman; Mr C. F. Uwins, chairman and managing director; and Mr G. T. Gedge, assistant general manager

Entrant and pilot of the winning aircraft in the 1960 King's Cup race, the Duke of Edinburgh and his equerry, Sqn Ldr John Severne respectively, were honoured at a Royal Aero Club dinner on November 23 (reported below). In this group photograph they are standing between Lord Brabazon and Mrs Pearl Hyde. On Lord Brabazon's right are Mr Peter Masefield and Sir Frederick Handley Page; on Mrs Hyde's left is the Minister of Aviation, Mr Peter Thorneycroft

Sport and Business

NEXT YEAR'S AIR RACING CALENDAR was outlined by Col R. L. Preston at a dinner at the Royal Aero Club on Wednesday, November 23. The main events will be a London - Cardiff race, probably starting at Panshanger, on June 2-3; the King's Cup race and other events at Baginton on July 13-15; and, to mark the 60th anniversary of the Club, an international business and touring aircraft competition at Kidlington on July 27-29. It was hoped, Col Preston added, that foreign aircraft would be permitted to fly in the King's Cup race.

The dinner was in honour of the 1960 British Air Racing Champion and winner of the King's Cup, in the person of Sqn Ldr John Severne, equerry to the Duke of Edinburgh, and Prince Philip himself (as entrant of the winning aircraft) was among the distinguished guests of the evening. Also present was the Minister of Aviation.

After a sparkling speech by Lord Brabazon, John Severne rose to confess that it had been his ambition to win the King's Cup race since he had been a very small boy. The Turbulent in which he had achieved that ambition, he said, had taken four men only six weeks to complete; the decision was taken to go for the fastest possible configuration rather than try to fool the handicappers in other ways; and the actual speed set up was 1½ m.p.h. better than he had calculated. The speaker wished to thank most sincerely the handicappers, but for whom, etc. . . . Also due for thanks was Norman Jones of the Tiger Club and of Rollasons who, the speaker disclosed, was hoping to take a formation of Turbulents to Moscow next year on the occasion of the British Trade Fair. Sqn Ldr Severne supported the plea that foreign aircraft should be allowed to fly in the King's Cup race: in this year's race, he pointed out, only three of the 21 aircraft taking part were less than ten years old—and these three were all French designs with foreign engines. Unless things were changed, he suggested, we should very soon be the only country running vintage national air races.

A SPEED of 90 m.p.h. on only 25 h.p. is the remarkable performance attributed to the attractive Fournier RF-01 ultra-light aircraft illustrated in the photograph below. Powered by a converted Volkswagen engine—at present of 25 h.p. but later to be replaced by 35 h.p. versions—the aircraft is a single-seater of extremely simple construction. Empty weight is 465lb and loaded weight 725lb. A retractable, single-wheel undercarriage is employed, together with balance skids under each wing. In addition to its use as a powered aircraft, the Fournier can be flown as a glider (the engine can be stopped and re-started in flight), with a performance comparable to that of a Grunau Baby.

The following features are claimed by the French Fournier company, which is represented in this country at present by Harold Best-Devereux, Flat 6, 22 Hall Drive, London SE26: (1) Economical cruise, 60 m.p.h. at 1.1gal/hr. (2) Normal cruise, 90 m.p.h. at 2gal/hr. (3) Soaring ability with L/D of 17. (4) Solo flying training at cheapest possible rates. (5) Semi-aerobatic category, both power-on and power-off. Data on the RF-01 are as follows:—

Span, 37ft; wing area, 118.4 sq ft; aspect ratio, 11; length, 19ft 6in; empty weight, 465lb; loaded weight, 725lb; cruising speed at 2gal/hr, 90 m.p.h.; cruising speed at 1.1gal/hr, 60 m.p.h.; rate of climb, 700ft/min; stalling speed, 35kt; take-off run, 100yd.

Fresh from France is the prototype Fournier RF-01 ultra-light, whose attractive performance is described on this page. A British demonstration tour next spring is planned, for both power-flying and gliding groups

RETROSPECT

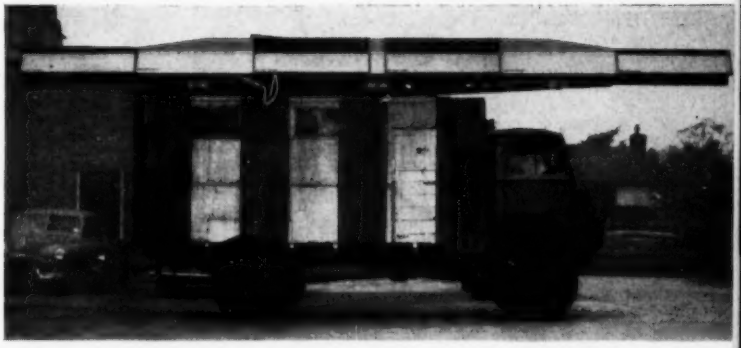
From "Flight" of December 3, 1910

Keen Rivalry between Aviatresses: During the current month there is likely to be some keen competition between Mdlle. Marvingt and Mdlle. Dutrieu, both of whom have set their hearts upon the Coupe Femina offered by the Parisian ladies' paper for the best flight by a lady flyer before the end of the year. On Sunday afternoon Mdlle. Marvingt rose on her Antionette monoplane at Mourmelon, and keeping at a height of about 40 metres she circled round and round the ground for 53 mins., thus easily beating the duration record which had been held up to then by Mme. de la Roche. The cold was intense, but the intrepid lady was well protected by furs, and although the gusty wind was a little troublesome at times the monoplane kept on its course very regularly, the turns being taken very wide, which accounts for the fact that the distance completed was only recorded as 35 kiloms. Having obtained her pilot's certificate, Mdlle. Dutrieu has decided to try and better this record, and with this end in view has taken up her quarters at Etampes, where she is daily practising.

DAVID OGILVY, manager of the London School of Flying, has always been quick to remind speakers at Elstree's annual dinner that brevity is the soul of wit. At the Sparrowhawk Hotel, Edgware, this year he heeded his own advice to the extent of omitting to make a speech at all, leaving it to Gp Capt G. H. M. Miles, chairman of the ABAC, to talk about the School.

Telling his audience that he had been told exactly what he might say, and how long he might have to say it in, Gp Capt Miles mentioned that Elstree's membership had multiplied ten times since the first 50 members were enrolled in 1952, and flying hours had increased from 612 to 4,818 last year. "A tradition and an atmosphere have been built up in British clubs," the speaker continued, but, when one thought where the clubs might have been with just a little Government encouragement, it was surprising they had got as far as they had. Although standards of club servicing were good, techniques were not what they ought to be and much thought was being given at the ABAC to making instruction on the ground easier for pupils to absorb.

FLIGHT SYSTEM SURVEY



A Cossor SSR4G secondary radar unit, mounted on a three-ton truck chassis, ready to leave the factory for operational trials at London Airport. It will be positioned some distance from the surveillance radar to which it will be slaved

Bendix Decca Developments

ONE of the results of Decca Navigator development undertaken by Bendix Pacific, the American agents for Decca, is the new Position Fixing and Navigation System (PFNS). It is intended mainly for use by ground vehicles, probably in conjunction with mobile transmitter chains, and even includes a man-carried version. The tactical battle-field applications of Decca have long been evident and PFNS is a complete system for such purposes. A major advance is that the complete equipment for vehicle installation weighs only 45lb, and includes only a Flight Log and the receiver, the latter weighing 20lb and measuring 13in × 11in × 4½in. The Flight Log includes the Decometers in the form of veeder counters and all the controls in its lower edge. Automatic referencing, one Decometer at a time, is provided and there is a telemetry system for notifying position of the vehicle to a central location.

Another part of PFNS is a special photographic installation capable of producing Flight Log charts from material such as maps or even aerial photographs. Called the map correlation system, the console adjusts the basic material for Decca projections and scales and makes the actual charts from film slides.

Height Indicator for Landing

A VERTICAL strip instrument to indicate absolute height and instantaneous vertical speed has been developed by the instrument division of Lear Inc and a prototype has been delivered to the Flight Control Laboratory of Wright Air Development Division. The instrument is intended to measure rates of descent up to 40,000ft/min and heights up to 200ft and has been prepared as part of the all-weather landing programme being jointly conducted by WADD and the Federal Aviation Agency.

On the one-inch-wide face of the strip instrument a pointer moves to indicate rates of descent up to 3,000ft/min. Behind this an orange tape begins to move upwards like a thermometer reading as the aircraft descends below 200ft. If the pilot maintains the orange height level aligned with the rate of descent pointer he will follow a smooth flare-out path on to the runway at zero height. If his rate of descent is more than 3,000ft/min, the moving pointer stops at the end of the scale and tape indications of actual rate of descent appear behind the pointer. A stabilized accelerometer can be coupled to the remote sensor of the vertical speed unit to provide rapid indications.

Training Simulators

A CONTRACT for the development of training simulators has been placed by MoA with Elliott Brothers (London) Ltd. The simulators will incorporate the new Elliott 502 computer, which is a special version of the recently announced ultra-high-speed Elliott 503. It is claimed that the 503 has a very high switching speed which allows it to operate 1,000 times faster than most types of the existing machines. The 502 will be capable of carrying out a large number of calculations simultaneously and the new simulator will make full use of this capacity.

Elliott-Automation Ltd, the parent company of Elliott Brothers (London) Ltd, have announced that their Swiss subsidiary, Elliott-Automation A.G., has moved into larger offices at 32 Holbeinstrasse, Zurich. The group also has subsidiary companies in France, Germany, Holland, Sweden, Australia and South Africa.

Atlantic Forward Scatter

FOLLOWING the successful adoption of forward scatter VHF communications between far-northern defence radar stations and the continental US, the FAA is considering the use of similar principles for ground-to-air communications over the Atlantic. Forward scatter for point-to-point communications over the northern Atlantic were proposed some years ago for ICAO but virtually abandoned in favour of land line and under-sea cable.

The FAA reports that PanAm's high-powered VHF station, supplied by Pye Telecommunications, in western Ireland has a range of 400 miles. Setting itself a goal of good transmission and reception for 98 per cent of the time, the FAA has determined to build on PanAm experience and to establish two similar stations on the western side of the Atlantic. Further transmitters in Europe might follow. Airborne receivers would have to be very slightly modified to receive the transmissions.

Radar Noise Meter

THE Compagnie Générale de Télégraphie Sans Fil (CSF) is producing a radar noise-figure meter, Type FB-340, which can be readily adapted to any existing radar and which will show at any moment the intrinsic noise in the receiver. Normal aging or unserviceability in the various receiver stages can often cause a more or less marked increase in the noise with corresponding loss of sensitivity. At present, the only method in most radars of assessing noise involves periodic delicate and lengthy maintenance measures, which involve switching off the transmitter. The FB-340 will immediately indicate an increase in noise, allowing the controller to take appropriate action. The instrument is first calibrated under static conditions, is powered from the normal mains supply and consists of two small units, one of which contains the meter. Installation in an existing radar station is reported to be quick and easy.

The Quest for Collision Avoidance

THERE are now five active and ten additional projects in the FAA's programme to develop collision avoidance equipment. Some time ago all efforts in this direction were combined under the Collision Prevention Advisory Group, which includes representatives of the US Army, Navy and Air Force, NASA, ATA, ALPA, NBAA and AOPA—in fact all the major users of American air space. The main target is to produce equipment which will indicate or initiate an avoidance manoeuvre when a collision risk occurs, but a plain proximity indicator is also being sought.

Almost every one of the many systems proposed about two years ago was overcome by fundamental technical difficulties, but the Bendix method of detecting direct and ground-reflected elements of a radiated signal and deriving range from the time difference, height from a code modulation and bearing showed some promise. It was described in *Flight* for February 27, 1959. Practical trials were due to be made last year and the fact that no firm information has yet been released seems to indicate some delay.

Sperry Gyroscope have proposed a system based on a new kind of flush-mounted scanning aerial originally developed for the USAF. Naval Ordnance Test Station at China Lake is also hopeful of devising an infra-red system.

Intermediate steps are the improvement of conspicuity of aircraft by special paints, lights and the use of smoke trails in areas of dense traffic. Anyone who has flown amongst vapour trails would appreciate how conspicuous a trailing aircraft can be, but how difficult it can be to assess its exact relative motion at more than about one mile range. Visibility of the smoke trail against various backgrounds might also prove a problem.

Doppler VOR Development

AS a continuation of the work to improve VOR beacons, especially those on difficult sites, the FAA is to test a new form of cylindrical instead of loop aerial unit which will allow 100 instead of 50 aerials to be incorporated in Doppler VORs. A new signal distributor will also be tried, the equipment being made by Dorne & Margolin under a $124,497 contract. Tests are to be made at Atlantic City.

The first Convair 990 (now the official designation of the Convair 600) was rolled out at San Diego on November 23. It will undergo ground-testing before its first flight in January. The shock bodies on the 2,250 sq ft wing house fuel as well as reduce wave drag at cruising speeds claimed to be up to 640 m.p.h. Mach number is 0.91, and powerplant is G.E. CJ-805-23 turbofans of 16,100lb. Twenty-five of the 239,200lb domestic model have been ordered by American Airlines, seven of the 244,200lb international version—also now officially known as the Coronado 990—by Swissair, two by SAS and three by REAL

AIR COMMERCE

RIDDLE ARGOSIES: CONTRACT SIGNED

AT long last, Riddle Airline's contract with Sir W. G. Armstrong Whitworth Aircraft has been signed. The ceremony took place in London on Tuesday of last week. Riddle are to take delivery of seven Argosies before next April and they have placed options on an additional eight. The value of the order is $12m, so that the price being paid per aircraft is about £610,000 with spares. Following this first firm civil contract, the number of Argosies now on order is 63, of which 56 are C.1s for the RAF.

Negotiations between the two companies began in the winter of 1958/59, and a provisional contract for three was announced in February 1959. Riddle subsequently made known a requirement for five after they were awarded a $25m three-year Logair contract with MATS, and the order was eventually increased to seven. The Argosies have been purchased primarily to fulfil the requirements of the Logair contract, which involves the supply of some 80 USAF domestic bases.

Final stages of flight and maintenance training are now being completed by Riddle personnel in the United Kingdom, headed by Harry W. Davis, the airline's chief pilot. An AWA pilot will be going to Miami to give further training and ground-maintenance instruction in the US has already started. An FAA representative is at present at Coventry, and AWA are working towards US certification.

Riddle, who recently bought seven DC-7Cs from General Dynamics (ex-SAS) say that with delivery of their Argosies their re-equipment programme will be complete. They estimate that this year's revenue of $8m will be increased to $30m next year—with an expected $2m profit.

As reported on this page, Riddle have confirmed their order for AW.650 Argosies. The first of seven, all due to be delivered by April, is seen in this new picture from Coventry. Note the prominent "Logair" markings, signifying the US military cargo contract for which these aircraft have primarily been bought

BOAC INTRODUCE THE DC-7F

TOMORROW, December 3, is the day set by BOAC for inauguration of its first Atlantic all-freight service. The first DC-7F leaves New York at 0100hr local time and arrives at London via Glasgow at 1750 GMT on the same day. The first westbound flight will leave London on December 6. Initially the frequency will be weekly, but from December 14 it will be increased to twice a week in each direction. Wednesday services from London and Friday services from New York call at Montreal and Manchester, and Thursday services from London and Saturday services from New York call at Glasgow; one hour has been allowed for turn-around at each transit stop.

Late-night or very early morning departures have been scheduled from each terminal point and freight delivered to London in the evening could be delivered in New York the following morning; westbound journey time via Manchester and Montreal is 16½hr and via Glasgow five minutes under 15hr. Eastbound times are respectively 14½hr and 11hr 50min.

The new service is to be operated by the two aircraft which BOAC sent back to the Douglas "conversion production line" at Santa Monica in September; it is not clear yet whether the corporation will have to pay import duty on the two converted aircraft, nor has the precise cost of conversion been made known. In an article on cargo conversion in *Flight*, October 28, 1960, it was estimated that the probable cost was about $400,000 each.

In the year ended August 1960, the latest month for which Ministry of Aviation figures are available, BOAC increased its freight traffic on western routes by 49.8 per cent above the corresponding previous period. Overall load factor, however, fell from 55 per cent to 51.9 per cent. Meanwhile, freight traffic on BOAC's eastern routes was slightly less in the twelve months ending August 1960 than in the corresponding period in the previous year, the decline being 0.7 per cent, the only minus figures in BOAC's results for the period concerned.

Footnote: During the first nine months of 1960, Pan American claim to have carried more than 6,000 tons of cargo across the Atlantic, an increase of nearly 46 per cent on the volume carried during the same period of 1959. Westbound the total was 6,631,460lb, eastbound 6,212,140lb.

BEA'S FLEET OF 14 COMET 4Bs

LAST week it was announced that BEA has placed a fourth repeat order for D.H. Comet 4Bs, for four more aircraft to bring the corporation's jet fleet up to 14. Of these, seven have been delivered, and deliveries to the latest order will follow handing over of the tenth aircraft next spring.

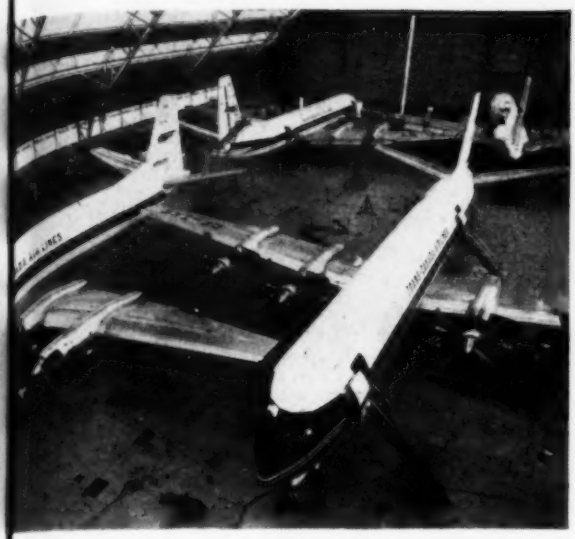
Footnote: According to an *Interavia* report, Aerovias Guest of Mexico plan to replace Super Constellations on the Mexico City - Paris route early next year with de Havilland Comet 4Cs.

ATLB OPENS SHOP

SECTIONS 2 and 3 of the Civil Aviation (Licensing) Act, together with the voluminous Regulations associated with that Act, came into force on December 1. This means that the board is now empowered to receive and consider applications for air services. However, no provision is being made for the actual issue of licences until March 30, 1961, as the existing transitional arrangements under the Air Transport Advisory Council will continue until that date. Similarly, the issue of air operators' certificates will begin on March 30, 1961.

During the four-month period December 1960-March 1961 the ATAC will slowly be passing over its business to the ATLB. In general, all applications for new services will be dealt with by the board, which will also deal with those amendments to existing services which are not required to be effective before March 31, 1961. The remaining group of applications—i.e., amendments which the applicant wishes to be effective before March 31, 1961—will either be dealt with entirely by the ATAC (if application for amendment was lodged with the council by December 1) or by both the council and the board working in liaison in those cases where amendments are sought after December 1.

A small proportion of the council's time has in the past been



The tenth of 23 Vickers Vanguard V.952s ordered by TCA is now off the assembly line at Weybridge and in the pre-flight hangar. Certification and delivery of the first TCA aircraft was imminent as this issue went to press. In not much more than a year's time the first VC10, due to fly early in 1962, will be occupying some of the floorspace seen in this picture

occupied on advising the Minister on various matters other than applications for scheduled services. The council will continue this function until January 1, 1961. Thereafter, those who wish to complain about the adequacy of Britain's air services will have to contact the board. Other than dealing with odd points concerning transitional licenses, the council's only remaining activity then will be to prepare their final annual report.

LORD BRABAZON'S KEROSINE TORCH

LAST week's report on the BBC "Panorama" feature about JP.4 and JP.1 (kerosine), in which Lord Brabazon took part, was a stop press item allowing no time for inquiries subsequently to be made of the participants. There were some differences between what actually occurred and what appeared to the viewer to have occurred: for example, the actual ignition of the JP.4 was not witnessed. This appears to have been due to editing of the film.

What actually happened was that Mr John Rickard first of all threw a lighted match into a pool of eight gallons of kerosine. (The scene of the "fuel duel" was a car park in Wembley near the BBC television studios.) Nothing happened, and Mr Rickard was then seen to apply a blowlamp for about half a minute. Again nothing happened. He took from his pocket a dry rag and dropped it in the pool, again applying a blowlamp. After a few seconds this rag caught alight, though there was no sudden conflagration. The kerosine did subsequently catch fire, although this was not seen by the viewers.

Mr Rickard was then seen to approach the pool of eight gallons of JP.4. He threw a match and retired immediately, though the actual ignition, as already noted, was not seen by the television audience. The JP.4 went up immediately, and one of the four two-gallon cans was seen to explode.

What were the reactions of the airlines to the programme? Lord Brabazon referred, without naming them, to two American international operators, a Canadian operator and a Belgian airline.

A TWA spokesman last week confirmed that JP.4 is uplifted by the airline at some European points, including Rome "on the basis of availability," though not at London or Paris. He guessed that out of all TWA's operations, perhaps 15 per cent only was JP.4. There had been some inquiries as a result of the BBC programme from travel agents. Would TWA continue to use JP.4? "If our technical people decide that there are safety advantages in the exclusive use of JP.1," he replied, "then of course we will use it exclusively."

Pan American's reaction was "no comment." TCA also said that there was nothing to add to the statement issued by the airline last July [after Lord Brabazon's first allusion to JP.4 at the ARB luncheon].

A Sabena spokesman last week confirmed that JP.4 was used on some routes and JP.1 on others. He could make no comment on whether JP.1 would be used exclusively in the future, but "we don't think that any airline would use any fuel that would be of any danger to the public. If there were such dangers, we would be the first not to use it."

A statement issued last week by Lufthansa on the relative properties of JP.1 and JP.4 said:—

"Turboprop engines such as, for example, those in Lufthansa's Viscounts, as well as jet engines such as those in the Boeing 707 and 720s, can be run on both these types of fuel. In air transport kerosine (JP.1) is preferred, whilst wide-cut gasoline (JP.4) is generally used for military aircraft. . . . If necessitated by the storage situation they may in certain jet engines such as, for instance, the Rolls-Royce Conway used by Lufthansa, be used as a mixture."

The German airline lists the foremost important differences between the two fuels as: (1) kerosine has about four per cent more heat energy per unit of volume than JP.4; (2) it does not evaporate so easily; (3) due to the higher flashing point, under certain conditions, there is less danger of fire with kerosine; (4) the somewhat greater water absorbing property of kerosine is disadvantageous. "There is a content of only about five per cent kerosine in average crude oil. However, by means of the cracking process . . . up to 20 per cent kerosine can be obtained from crude oil." Lufthansa adds: "JP.4 which, as a wide-cut fuel, represents a type of diluted petrol, is mainly used for military air operations since some 50 per cent normal crude oil can be used for this jet fuel and consequently the larger quantities necessary are gained."

A PIA spokesman last week said that his airline would continue to use JP.4; they were "unconvinced" that JP.4 was more dangerous as an aircraft fuel. They would "keep an open mind until the results of more serious research are made known."

THE EXPANDED AIR SAFARIS

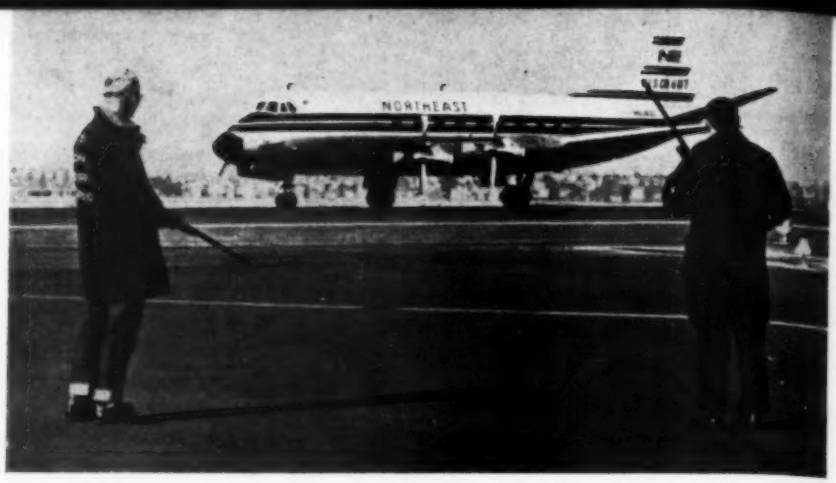
SINCE the announcement last week that Air Safaris have acquired Don Everall the assets of Falcon Airways have been added to the enlarged company.

As suggested in *Flight* last week the Herald is being seriously considered as part of Air Safaris' re-equipment programme. It would be used on scheduled services and Douglas DC-6s may be added for seasonal tour work and for charters. Meanwhile, by taking over Falcon's two Hermes along with their spares, equipment, hangars and workshops, the joint fleet now comprises three Hermes and six Vikings. There is, however, no connection between Falcon Airways and the new Air Safaris, who understand that Falcon will be re-equipping with other aircraft.

The company will continue to maintain its head office, main commercial departments, sales and accounts, and operations base at Gatwick Airport, but until such time as the Ministry of Aviation can offer land at Gatwick for the erection of a hangar, the overhaul and maintenance base, along with the buying and technical departments, are to be established at Hurn. This will also be the base for the recently approved scheduled services to Europe in addition to charter activities.

Birmingham will continue to figure extensively in the reorganization as aircraft will also be based at Birmingham Airport for use in connection with the existing scheduled (Don Everall) services and passenger and cargo charters. This is apart from additional operations which the new Air Safaris hope to generate in the area.

This is how several million BBC Television viewers saw Lord Brabazon (centre) and Mr John Rickard (right) after their kerosine/JP.4 inflammability demonstration on BBC "Panorama." The programme was reported last week and a further note appears on this page



At Logan International Airport, Boston, where an Electra crashed on October 4 as a result (it is now fairly certain) of birds, special patrols armed with shotguns and torches are employed to keep runways and the airport perimeter clear of birds. Recently a jet captain abandoned a take-off after ploughing through a flock of sandpipers on the same runway which the Electra had used. There has also been wholesale destruction by fire of nesting places in the marshes fringing the airport

AIR COMMERCE . . .

HOW CROWDED IS LONDON'S AIRSPACE?

THE number of aircraft that used London-area airports in August 1960, according to figures just published by the Ministry of Aviation, was slightly less than in August 1959. Total aircraft movements were 22,755 compared with 22,779. Of course the number of *air transport* movements was, as always, greater; and because transport aircraft are getting bigger the number of passengers handled at London's airports was proportionately larger.

But it is the total number of aircraft movements in the peak period which sets the limit to the capacity of an air traffic control system. It appears that the pressure on London ATC is not being intensified to the extent which might have been suggested by the closing down of airports like Blackbushe and Croydon. Indeed, it is a fact that the total number of movements at London-area aerodromes in 1959 was 18 per cent less than in 1958. The exact figures were 210,986 in 1959 compared with 258,318 in 1958.

This decline is an average for the whole year, and it does not take account of peak conditions. But there seems to be a *prima facie* case for the suggestion that London's airspace is not getting more crowded. The explanation is probably that general aviation and private flying are drifting away from Britain's capital.

ANOTHER ROUTE FOR THE CARVAIR

SINCE *Flight*'s round-up of vehicle ferry routes and applications was published on November 11, a request for a further approval has been submitted to the ATAC by East Anglian Flying Services. The airline are asking for an amendment to their present authorization on the Bristol and Cork route so that they can introduce the Carvair and carry supplementary freight and 25 incidental passengers daily. In the latter respect, they are following the lead of Silver City and Channel Air Bridge, both of whom have applied for increased freedom of action on long-range vehicle-ferry routes. These applications will be heard not by the ATAC but by the Air Transport Licensing Board, under terms of reference which could allow more *laissez-faire* in this type of air transport operation.

Public interest in deeper-penetration services on Channel Air Bridge routes is being maintained by publication of provisional passenger and vehicle fares from Southend. Still subject to IATA agreement and Government approval, the single fares proposed for passengers to Bremen might be £11, to Dusseldorf £9, to Strasbourg £12 10s and to Lyons £12 10s. Vehicle fares for single journeys, taking as an example a 13ft 6in long car, would be £16 for a single journey to Bremen, £14 to Dusseldorf, £17 to Strasbourg and £19 to Lyons. The cheapest vehicle single fare is £9 for an 11ft car to Bremen, and the most expensive £37 for a car over 18ft long to Strasbourg.

The Air Bridge are also conducting a survey of passenger reaction to the long-range routes. It includes such questions as: "Have you used car sleeper trains? What do you consider are the main advantages of the new routes and the new Carvair aircraft? What improvements would you like to see for the long-range services? Would you be interested in night flights (between midnight and 6 a.m.) at lower fares?"

In an accompanying letter Mr D. A. Whybrow, director of Channel Air Bridge, says that "It is not unusual for some considerable time to elapse before approval [of foreign governments] is given, and we can only say at this stage that we hope to operate the services in 1961."

Footnote: Another change to the table published on page 762, *Flight* November 11, concerns the BKS vehicle ferry service between Liverpool and Dublin. After a successful summer season, decline of traffic in October has led to its suspension for the winter months. It is hoped to resume the service in early April.

WHAT IS A PASSENGER WORTH?

AS is well known, the limit of a carrier's liability for a passenger is 125,000 gold francs, or about £3,000. This is fixed by Article 22 of the Carriage By Air Act, 1932, which gave effect in English law to the international convention signed at Warsaw in 1929. Unless a passenger (or dependent) can prove wilful misconduct on the part of a carrier, or that he did not deliver a ticket, he has a right to no more than £3,000.

Five years ago an international agreement known as the Hague Protocol of 1955 was drawn up with the purpose, among other things, of doubling the extent of this liability. To become international law it required ratification by 30 states. So far eleven have ratified, and among the 19 others who have not so far done so is the United Kingdom.

Now, Mr Ronald Bell (Con, South Bucks) is to introduce into Parliament a private member's Bill proposing an amendment to the Carriage By Air Act to increase liability to the £6,000 limit of the Hague Protocol. It is possible that if Britain makes the change there is every likelihood that the 18 others will follow.

SPRINGBOK BOEING SALVAGE

THE South African Airways Boeing 707 belly-landing at Nairobi is to be the subject of a public inquiry this month. It now seems certain that, while on an instrument approach, the aircraft touched the ground a mile from the runway threshold, causing the nosewheel and main undercarriage to collapse.

Meanwhile, it is hoped to repair the 707 sufficiently for it to be flown to Seattle for the work to be completed; three Boeing engineers have joined South African Airways' technical staff at Nairobi to assist in the salvage.

It took four hours to move the aircraft from the end of the runway to the hangar area because of severe damage to the nosewheel. Initially the airframe was drained of fuel, stripped of its engines, fin, rudder and cabin equipment and then lifted on six 12-ton pneumatic bags under the wings and by two 15-ton jacks. Undercarriage doors were cut out and the oleo struts deflated so that the gear could be lowered. Once the undercarriage was down, the aircraft was towed back on to the runway over a specially prepared path of 450 railway sleepers and ½-inch steel plates.

Protests against jet noise are now being heard around the world. At Tokyo International Airport, the Metropolitan Government are now conducting their own surveys of jet and piston-engine noise; here investigators get down to a comparative recording on a DC-6

Welcoming the first Aer Lingus Boeing 720 on its arrival at Dublin Airport on November 18 are (left to right): Mr James Gorman, asst general manager, Aer Lingus-IIA; Mr Sean Lemass, Prime Minister of Ireland; Mr Conor Carrigan, director, Aer Lingus; Mr P. Lynch, chairman; Mr Erskine Childers, Minister for Transport and Power; Mr J. Lynch, Minister for Industry and Commerce; and Mr J. F. Dempsey, general manager

A LITTLE BREAKTHROUGH

UP to the beginning of 1959, until when there had been no published criticism of the growing airline practice of pooling, the airlines only rarely referred to it. Nowadays their public relations departments, aware that pooling does not necessarily wash whitest, have tended to anticipate criticisms by rather self-consciously stressing the increased benefits it is said to confer upon the public.

For example, after the recent review in Bombay of their tripartite agreement by Air-India, Qantas and BOAC, Air-India issued a brief statement which, after noting that the volume of traffic carried by the three partners had shown a significant increase over last year, said that the agreement is "proving beneficial to the interests of the travelling public through the co-ordination of schedules of the three airlines and the free interchange of tickets between them." Likewise, when BEA recently announced the conclusion of a pool agreement with Aeroflot, their 17th such pool agreement, special emphasis was laid upon the better-service-to-the-public angle.

Of course, tickets can be, and are, interchangeable among interlining airlines without pooling; and though agreement not to "hog" the best times of the day is sometimes facilitated by sharing revenues, pooling is not the prerequisite of what has come to be called by its protagonists "a more convenient spread of schedules throughout the day"—as is proved by the highly competitive US domestic airline industry, which rejects pooling.

The standard press release on pooling was published in "Straight and Level" for April 29, 1960. Prepared by Boost High-Gloss Images Ltd, it reads:—

"The latest pool agreement is a further step along the trail blazed by Plummet Air Lines towards giving that better service to the travelling public which it has always been our privilege, and indeed duty, to provide. More convenient schedules, common ticketing arrangements and higher load factors mean not only better service to the public but, reduced costs too, which, of course, mean lower fares. The evidence for the advantages of pool agreements is overwhelming . . ."

But, seriously, at last an airline has published a statement about pooling which, though offering the inevitable reassurance about the public interest, nevertheless for the first time actually attempts to give some information. Since this statement is by way of being historic, we publish it in full. It is by Mr Basil Smallpeice, managing director of BOAC:

"I have just been down to East Africa where I completed discussions, which started as far back as 1958, for consolidating the various revenue pools which BOAC has had with East African Airways, Central African Airways and South African Airways into one comprehensive pool. Each airline will, of course, continue to maintain its separate identity and character as in the past.

"East Africa is now only 12-15hr from London, and these new arrangements offer considerable advantages to both passengers and travel agents in providing, with full interchangeability of tickets, a wide choice of jet and turboprop services to the main centres, building up next summer to a total of 23 flights a week in each direction.

"British United Airways will share in these arrangements. They are not direct parties to the negotiations which BOAC have had with the three airlines in East, Central and South Africa, but, by virtue of their association with BOAC, they will take their due proportion of the services which UK airlines are entitled to provide.

"During the first 18-month phase of the new comprehensive pool, the aircraft fleets of the constituent airlines will not be in strict balance with the traffic entitlement of their respective territories. But as an illustration of what has been agreed, UK airlines will provide, in the summer of 1961, 49 per cent of the total capacity provided by the pool. Of this UK share for the whole route, the agreed services of British United Airways to East and Central Africa will constitute 14 per cent and the BOAC flights (which serve South Africa also) will constitute 86 per cent."

This candid statement—by normal pooling press release standards—contains some hard figures about this complex African pool. It constitutes a major change of policy since last September when Sir Gerard d'Erlanger, then chairman of BOAC, said in reply to a question about the African pool: "I have spoken to our partners about this question, and we are all agreed that no information can be published." It is hoped to make a closer study of this statement and its implications for the five airlines involved in a subsequent issue.

FIXED-WEIGHT BAGGAGE

ALL BOAC aircraft except Boeing 707s are now being loaded according to a standard scale of passenger-baggage weights which the corporation have recently introduced. This means, in effect, that for load and trim purposes, passenger hold and cabin baggage will be calculated on average values—13kg (28lb) per passenger for hold baggage, 4kg (9lb) of cabin baggage for first-class passengers and 2kg (4½lb) of cabin baggage for all other classes.

The aim of the system is to simplify loading and speed-up the preparation of trim sheets. It should eventually be possible to analyse the effect of these paper simplifications in relation to a speedier system of baggage handling.

What advantage is there for the passenger? Not much at first, since luggage will still have to be weighed and charges will still be levied for baggage in excess of the standard allowance. But in the long term, simplified loading should mean that pre-flight formalities could be reduced. It is believed that BOAC, who are operating the system on all their routes, are the first airline to introduce this technique—already in use domestically in the US and by TCA—on an inter-continental basis.

One of the services at TWA's maintenance base at Mid-Continent International, near Kansas City, is this wash-down bay for aircraft that come in for overhaul. Hot water and detergent is applied from hydraulic derricks at a pressure of 60lb/sq in and several types of nozzle are available for cleaning different parts of the aircraft

AIR COMMERCE . . .

DUTCH "COLONIALISM" IN AIR CEYLON

IT is "common knowledge" that Air Ceylon is a colony of Holland and that Air Ceylon [in which KLM has an interest] has been refused traffic rights in many countries in view of this fact. Furthermore the present administration of Air Ceylon is "controlled by Dutch imperialist methods."

These accusations are made by the Airline Pilots Association of Ceylon in a letter to the Ministry of Transport, requesting that one of the KLM directors of Air Ceylon should be removed. "In view of the fact that there is a colour bar and Dutch colonialism prevailing in Air Ceylon," the Ceylon pilots write, "thereby undermining the national airline and causing suppression of the aspirations of the working people such as the pilots and the technical qualified staff of Air Ceylon, we would earnestly request you to remove immediately at least one of the Dutch directors of the board of Air Ceylon and replace him with a representative of the Airline Pilots Association of Ceylon as there is no qualified Ceylonese technical officer to represent the national aviation interests in Air Ceylon."

ITALY AND EUROCONTROL

CIVIL and military authorities in Italy appear to disagree about Italy's attitude to Eurocontrol—the international ATC agency for the control of upper air space in Europe, proposed by the six members of the European Common Market (West Germany, Luxembourg, Belgium, Holland, Italy and France), and approved in draft form by Britain at a meeting in Rome last June. The Minister of Aviation said last week that he hopes to sign the Eurocontrol Convention this month.

At a recent meeting of the Centro per lo Sviluppo dei Trasporti Aerei, the president and secretary-general and three Alitalia crew members were reported to have declared themselves in favour of Italy's participation in Eurocontrol, and members of the Ministry of Defence (Air) against it. Italy is not yet, it is said, prepared to sign the convention, and will not take part until "present doubts" regarding Eurocontrol "are no longer justified."

In a press statement last week an Italian Air Force officer, Brig-Gen Giovannozzi, said that there was no real operational need for Italy to join Eurocontrol. It would cost a great deal of money and would affect the efficiency of the traffic control service in Italy. The need for additional funds for Italian internal ATC was agreed by both civil and military alike.

It has been previously reported (November 18 issue, page 777) that the Dutch also want to postpone signing of the Eurocontrol Convention "until the first quarter of next year."

A 9ft by 5ft door has been cut in this Aer Lingus DC-3 by Scottish Aviation to enable the Irish airline to transport trolley-mounted P & W JT3C-7 jet engines of its 720 fleet. The conversion was done in ten weeks

BREVITIES

The Republic of the Ivory Coast has become the 80th member of ICAO.

Mr Clarence N. Sayen is re-elected president of the American Airline Pilots Association for a further four-year term.

Mr W. G. Franklin has been appointed joint managing director of Silver City Airways in place of Mr Hugh C. Kennard who has resigned from the company.

Tomorrow, December 3, the recently delivered Boeing 720 of Irish International Airlines is due to visit London Airport on a proving flight. The aircraft was delivered to the Irish airline on November 18.

Japan Air Lines are using a Bendix G-15D digital computer to assist in the flight planning of their DC-8s. Wind velocity at various altitudes, temperatures, barometric pressures, passenger and fuel weights are fed to the computer and the necessary information to compile a flight plan is produced in less than 70sec.

The resignation is announced, on the grounds of ill-health, of Mr F. G. Jeans, managing director of Western Airways Ltd, Weston Airport. Before joining the Straight Corporation as chief engineer in 1937, Mr Jeans was chief aircraft maintenance engineer of British Airways. His private address is Upper Weare, Axbridge, Somerset.

The chairman of Central African Airways, Mr A. E. P. Robinson, has been appointed High Commissioner in London for the Federation of the Rhodesias and Nyasaland. He was a member of the Monckton Commission which recently inquired into the future of the Federation. His successor as chairman of CAA, whose general manager is Mr Max Stuart-Shaw, is not yet announced.

A Philippine Air Lines DC-3 carrying 29 passengers and four crew on a flight from Iloilo to Manila was reported missing on November 23. It left Iloilo City, 300 miles south-east of Manila, in the late afternoon and was last reported at 6,000ft 100 miles south-east of Manila. At the time of going to press no trace of the aircraft had been found.

Following a visit to Rolls-Royce recently, Mr Charles Abell, BOAC's chief engineer, was able to report that "a major effort" has been, and still is, being put into the Conway development and production programme, and that these are beginning to show results. The corporation is confident that next summer's Conway requirements for its 707 fleet "will be met in accordance with plans."

El Al has leased a Boeing 707-420 from Varig and is due to start operations during the first week of January on a once-weekly service from Lydda to New York via London or Paris, increasing to twice-weekly on February 19. Starting in June, El Al will operate their own 707-420, enabling the frequency to be increased to four times weekly. The Varig aircraft will be partly crewed by Israelis, and will have 120 economy-class and 20 first-class seats. El Al Britannias will be used for the shorter European routes and for charter flights.

The Ministry of Aviation announces the appointment of Mr Henry Hardman, CB, at present a deputy secretary in the Ministry, to be permanent secretary in succession to Sir William Strath, KCB, who is retiring from public service at the end of the year to become managing director of the British Aluminium Co, and a number of the board of Tube Investments Ltd. From 1955 until last May, Mr Henry Hardman was a deputy secretary in the Ministry of Agriculture, Fisheries and Food. During the war he served in the Ministry of Food. From 1946-48 he was with the British Food Commission in North America. In 1953-54 he was Minister to the UK delegates to NATO and OEEC in Paris.

The new base of Flying Enterprise, the Danish independent Argonaut operator, is Hangar 117, Copenhagen Airport, telephone DRagor 1700.

A Caravelle airframe which has successfully completed 150,000hr has been subjected to 3,600 cycles of unspecified "exaggerated loads" before failure.

Mr F. E. McGinnety has been appointed director general of inspection by the Ministry of Aviation. He took up his duties at the beginning of November.

The Guild of Air Pilots and Air Navigators has awarded the Master Air Pilot's Certificate to Capt N. A. Lewis of TAA and Capt R. C. Griffin of British International Airlines, Kuwait.

Use of American Airlines' Airchecks, a system in which passengers make their reservations and write their own tickets, has increased by 40 per cent in the last six months. It is now being used at the rate of 7,000 a month.

Following flight-test measurements, take-off and landing requirements for the swing-tail Canadair CL-44D4 have been reduced by about 11 per cent. Balanced take-off field length at max weight (205,000lb), previously 7,660ft, is now 6,800ft. Landing field length at max landing weight (165,000lb), previously 6,780ft, is now 5,980ft.

An Italian inquiry has found that the TWA Super Constellation crash at Milan, Italy, on June 28, 1959, was probably caused by a fuel explosion touched off by static electricity. The accident occurred 15min after the aircraft took off on a flight from Paris; 68 people were killed. Investigation of the wreckage showed that one of the seven fuel tanks exploded.

An Indian delegation led by Dr D. S. Kothari, scientific adviser to the Indian Ministry of Defence, has returned from Moscow without concluding the purchase of a fleet of Russian helicopters which India had agreed in principle to buy However, the delegation is reported to have bought eight An-12 transports. The An-12 is believed to be the aft-loading variant of the An-10A passenger transport.

The last chapter in the mystery of the Southern Cloud, which crashed in the Snowy Mountains on a flight between Sydney and Melbourne on March 21, 1931, will be written on December 10. On that date the remains of the two pilots and six passengers will be buried in a common grave. Since the wreckage was found on October 26, 1958, the remains of the victims have been in the hands of local police; it was believed that when the aircraft disappeared it was carrying gold bullion.

This unusual view of the Caravelle's power-plant shows to good effect the sound-suppressor/reverser of the Rolls-Royce Avon

XANADU